

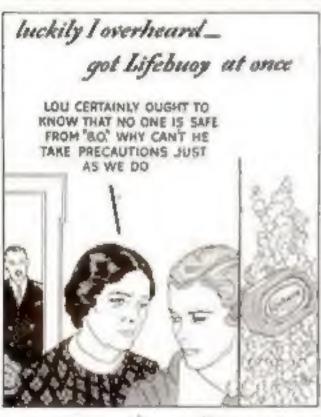
NEW INVENTIONS . MECHANICS . MONEY MAKING IDEAS HOME WORKSHOP PLANS AND HINTS . 350 PICTURES

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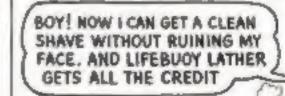
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# Straight Facts about PLYMOUTH'S startling "FLOATING RIDE"



Showing How "Back-Seat Bounce" and "Spring Gallop" were Outlawed by New Plymouth Engineering Principles

PLYMOUTH'S "FLOATING RIGE" has been called the year's greatest advance in riding comfort. As one engineer put it—"I've never before driven a car like this. It 'glides' over bumps and ruts as if they didn't exist!"

Like all outstanding engineering feats, Plymouth's "Floating Ride" originated with a fundamental change in our design.

The old conventional method of distributing car weight called for stiff springs in the front, where weight was ' less, and long, flexible springs in the rear, where the weight was greater. proved by over a hundred million miles of travel in last year's famous "Airflow," They moved engine and seats forward.

Result? Back-seat riders sit forward of the rear axle, away from bumps and "spring gallop."

There's more leg-room and comfort.

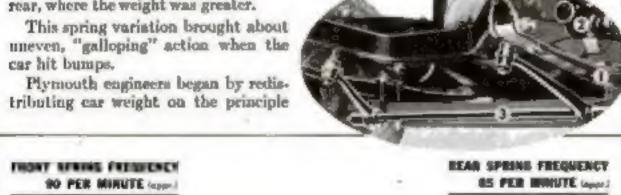
Then Plymouth engineers developed a new kind of stronger, "livelier" front spring made of "Mola" Steel . . . which aids in reducing oscillation frequency

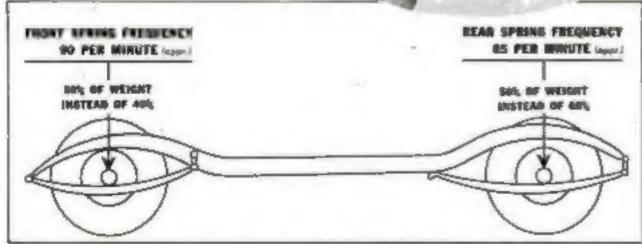
Center of weight is in the rear. Back-seat passengers sit directly ever the axle, receiving not only the read-shocks but also the "spring gallep,"

to 90 per minute, compared to 135 per minute in an ordinary car. They added a sway eliminator at the front to give new safety on curves.

Go in to see these history-making improvements at any Dodge, De Soto or Chrysler dealers. They have the new Plymouth on display. Drive it. Convenient purchases by the Official Chrysler Motors Commercial Credit Plan.

Left: Plymouth's New Front Spring Assembly: (1) Semi-Elliptic Springs of new "Mola" Steel; (2) Double-action Shock Abouthurs; (3) Sidesway Eliminator,





PREVIOUSLY, about 40% of the car weight was on the front exic—60% on the rear cale. Plymouth's Correct Weight Re-Distribution divides axic load equally, opens way for new spring coordination . . . introduces a stronger, safer, better-riding and loager-lasting car.

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# How I Improved My Memory In One Evening

#### The Amazing Experience of Victor Jones

"Of course I place you! Mr. Addison Sims of Seattle.

"If I remember correctly—and I do remember correctly—Mr. Burroughs, the lumberman, introduced me to you at the luncheon of the Seattle Rotary Club three years ago in May. This is a pleasure indeed! I haven't laid eyes on you since that day. How is the grain business? How did that merger work out?"

The assurance of this speaker—in the crowded corridor of the Hotel St. Regis—compelled me to look at him, though it is not my habit to "listen in" even in a hotel lobby.

"He is David M. Roth, the most famous memory expert in the United States," said my friend Kennedy, answering my question before I could get it out. "He will show you a lot more wonderful things than that, before the evening is over."

And he did.

As we went into the banquet room the toastmaster was introducing a long line of the guests to Mr. Roth. I got in line and when it came my turn, Mr. Roth asked, "What are your initials, Mr. Jones, and your business connection and telephone number?" Why he asked this, I learned later, when he picked out from the crowd the 60 men he had met two hours before and called each by name without a mistake. What is more, he named each man's business and telephone number.

I won't tril you ail the other amazing things this man did except to tell how he called back, without a minute's hesitation, long lists of numbers, bank elemings, prices, parcel post rates and anything else the guests gave him in rapid order.

\*\*\*\*

When I met Mr. Roth—which you may be sure I did the first chance I got—he rather bowled me over by saying, in his quiet, modest way:

"There is nothing miraculous about my remembering anything I want to remember, whether it be names, faces, figures, facts, or something I have read.

"You can so this as easily as I do.

Anyone with an average mind can learn
quickly to do exactly the same things which
seem so miraculous when I do them.

"My own memory," continued Mr. Roth, "was originally very faulty. Yes it was—a really poor memory. On meeting a man

I would lose his name in thirty seconds, while now there are probably 10,000 men and women in the United States, many of whom I have met but once, whose names I can call instantly on meeting them."

"That is all right for you, Mr. Roth," I interrupted, "you have given years to it. But how about me?"

"Mr. Jones," he replied, "I can teach you the accret of a good memory in one evening. This is not a guest, because I have done it with thousands of pupils. In the first of seven simple lessons which I have prepared for home study, I show you the basic principle of my whole system and you will find it—not hard work as you might fear—but just like playing a fascinating game. I will prove it to you."

He didn't have to. His Course did; I got it the next day from his publishers.

When I tackled the first lesson, I suppose I was the most surprised man in forty-eight States to find that I had learned—in about one hour—how to remember a list of one hundred words so that I could call them off forward and back without a single mistake.

That lesson stuck. So did the other six.

Read this letter from one of the most famous trial lawyers in New York

"May I take secretion to state that I tugard your service in giving this system to the world as a public benefaction. The wonderful simplicity of the method, and the ease with which its principles may be equited, especially appeal to me. I may add that I already had occasion to test the effectiveness of the first two lessons in the preparation for trial of an important action in which I am about to engage."

This men didn't put it a bit too strong.

The Roth Course is priceless! I can count on my memory now. I can call the name of any man I have met before—and I keep getting better. I can remember any figures I wish to remember. Telephone numbers come to mind instantly, once I have filed them by Mr. Roth's easy method.

The old fear of forgetting has vanished. I used to be "scared stiff" on my feet-because I wasn't sure. I couldn't remember what I wanted to say.

Now I am sure of myself, confident, and "easy as an old shoe" when I get on my feet at the club, at a bunquet, in a business meeting, or in any social gathering.

The most enjoyable part of it all is that I am now a good conversationalist—and I used to be as alent as a sphim when I got into a crowd of people who knew things.

Now I can call up like a flash of lightning most any fact I want right at the instant I need it most. I used to think a "hair trigger" memory belonged only to the prodigy and genius. Now I see that every man of us has that kind of a memory if he knows how to make it work. I tell you it is a wonderful thing, after groping around in the dark for so many years to be able to switch the big searchlight on your mind and see instantly everything you want to remember.

This Roth Course will do wonders in your office.

Since we took it up you never hear anyone in our office my "I guess" or "I think it was about so much" or "I forget that right now" or "I can't remember" or "I must look up his name." Now they are right there with the answer—like a shot.

Here is just a bit from a letter of a well-known sales manager up in Montreal;

"Here is the whole thing in a notshell: Mr. Roth has a most semarkable Memory Course. It is simple, and easy as falling off a log. Anyone—I don't care who he is--can improve his Memory 100% is a week and 1,000% in six months."

My advice to you is don't wait another minute. Send for Mr. Roth's amazing course and see what a wonderful memory you have got. Your dividends in increased power will be enormous.

VICTOR JONES.

#### Send No Money

Be confident are the publishers of the Roth Memory Course that you will be senared to see how easy it is to double, yes, triple your memory power in a few short hours, that they are willing to send the course on free examination.

Don't send any money. Merely mail the coupon and the complete course will be sent, all charges prepaid, at once. If you are not entirely satisfied send it back any time within five days after you receive it and you will owe nothing.

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4



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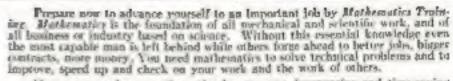


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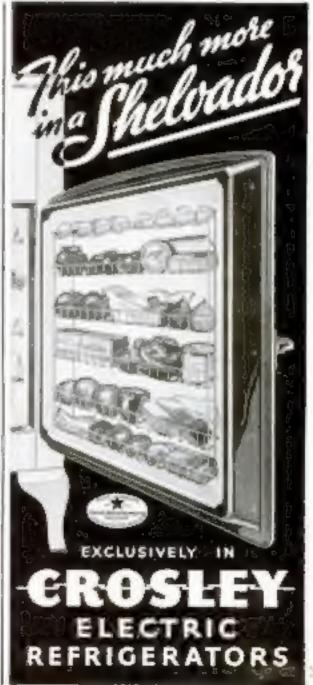


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# MOTORISTS WISE



ALWAYS SIMONIZ A NEW CAR

Here are two ways of lighting your desk for chee work or for study. At the right, the direct way. Note the sharp contrast and the glare, Below, a lamp giving both direct and indirect illumination, to at to do away with all hursh differences. of light and shade. The betper method is abviously this



# Testing the Lights

IN YOUR OWN HOME

CCURATE tests have replaced haphasard judgment to put house lighting on a scientific basis. At one time, any light was a good light regardless of its size, location, or use. Now, trained experts attack lighting problems in laboratories and manufacturers run extensive tests to determine just what lamp designs give the best in illumination.

By following a few simple rules, even you as a householder can perform interesting tests that will help you obtain good lighting in your home.

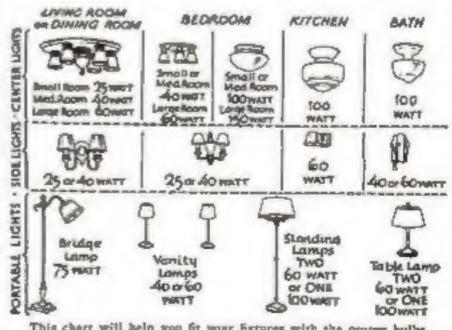
First of all, make sure that your lamps

and fixtures are fitted with the proper bulbs. Provided with the special chart below, make a tour of your rooms: checking the lights as you go, and making a list of the bulbs needed to fill empty sockets and replace undersize units. Remember, an excess of light is less dangerous than too little. Illuminating engincers have found that it is practically impossible to get too much light if it is properly applied.

Along this line, Dr. Mathew Luckiesh, potBy R. M. BOLEN

Secretary, Popular Science Institute

ed lighting expert, recently completed a series of fascinating tests. Using more than a thousand human subjects, he first seated each under an ordinary bridge lamp fitted with a medium-power bulb (60watt) and asked him to read from a page of fine print. As the subject read with acknowledged ease, Dr. Luckiesh measured the illumination on the page with a small light meter. In each case, he found



This chart will help you fit your firtures with the proper bulbs

it to be less than ten foot candles.

As a second step in the test, the printed page was placed in a mysterious rectangular black box, constructed like a miniature stage and fitted with a carefully concealed source of light the brilliance of which could be controlled by a convenient knob on the front panel.

STARTING with the light dim, Dr. Luckiesh then asked his subjects to turn the knob and increase the illumination until the printing could be read with the greatest ease. In almost every case, a light meter substituted for the page at the end of the experiment showed illumination of more than three hundred foot candles—close to forty times the light given by the original bridge lamp. If our eyes could talk, believes Dr. Luckiesh, they would ask for many times the light we normally give them.

From another set of tests recently completed, lighting engineers have formulated rules to govern the design of lamps used for reading, sewing, and close work. It you desire, you can apply them to the lamps in your home. For the most part, an ordinary tape measure is the only tool

required.

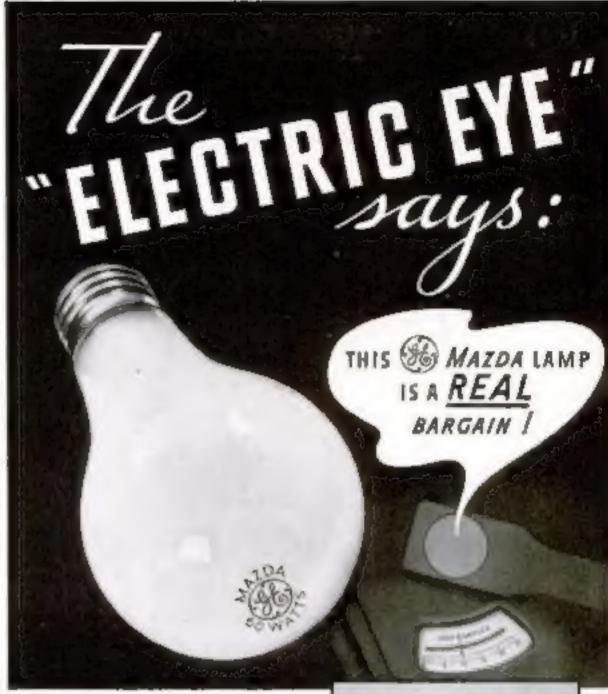
To start with, shades for bridge, table, or reading lamps should meet three general requirements. First, they should be translucent, but not so translucent that the position and shape of the lighted bulb is clearly defined. Second, they should be light in color; light, or medium cream, ivory, or rose being the preferred tints. And third, they should be of the open top variety.

To test the general proportions of your favorite bridge lamp, place your eyes about thirty-eight inches from the floor (in a normal sitting position) and about two feet away from an imaginary line drawn vertically down through the center of the bulb. If the lamp is properly constructed, no portion of the bare bulb should be visible. There should be no glare and no marked light and dark contrast.

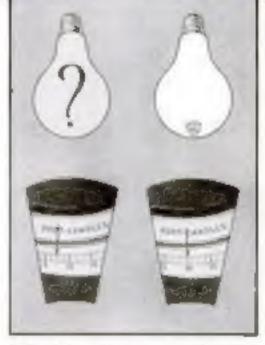
These same test dimensions can be applied to lamps used on end tables. In testing a table lamp, however, the eyes should be thirty-eight inches from the floor and thirty-two inches from the center line of the lamp.

IN RECOMMENDING the best design for reading and study lamps, lighting experts have been even more specific. Lamps supplying indirect as well as direct light have been found to be easiest on the eyes, avoiding glare and sharp contrasts between light and dark. The standard or main center post should be high enough to place the bottom edge of the shade ninetern and one half inches above the top of the table, while the shade itself should have a bottom diameter of sixteen and five eighths inches, a top diameter of eight inches, and an overall height of eight and one half inches.

By giving these specifications, engineers in no way condemn the artistic lamps used purely as decorations. They merely advise against their use as illumination for close work. Decorative lamps have their place in every home, but that place should not be next to your favorite reading chair.



The poorly-made "bargain" lamp is no bargain, says the "electric eye." A lamp is a bargain to this marvelous instrument only when it delivers ALL the light it should for the current it consumes. General Electric MAZDA lamps do just that! You don't need the electric eye to see it. or to be sure that you are getting a real burgain in light. Just look for the famous General Electric monogram @6. General Electric Company, Nels Park, Cleveland, Ohio.



Both of these lamps are marked "60watta," which weans they use exactly the same amount of current. But notice the mide difference in light output, as measured by the "Electric Eye" between the good lamp and the inferior une.

General Electric manufactures lamps for home lighting and decoration, automobiles, flushing bts, photography, stores, offices and factories, street lighting and signs—also Sunlight lamps.

GENERAL E ELECTRIC
MAZDA LAMPS

# Our Readers Hungry Boys Stop Eating When Signal Light is Red

WHEN the Aberdeen, Scotland, battalion of the Boys' Brigade goes to camp, it carries with it a remarkable robot for use in the boys mess. The robot is a signal made of three lamps,-red, yellow, and green (as in a traffic signal)-mounted on a vertical board rising

from a base that contains a motor battery and switches. When the padre, or commanding officer, is to say anything to the poys, he switches on first the yellow light, for warning that silence is desired, then the red light for complete cessation of cating and talking. The green light signifies



that the boys may ent, or, if their meal is over, that they may leave the table. We have found the signal very satisfactory; it impresses visitors much more favorably than the more customary blowing of a whistle or shouting. Perhaps my description of our messroom signal will interest readers on your side of the ocean and lead them to imitate it. I should be most happy to learn what they think of our idea.-J.R.K.P., Aberdeen, Scotland.

#### His Two-Tube All-Electric Set Can do Wonders

I want to applaud you for the fine radio hook-ups you have published lately. Keep up the good work. While looking over the letters in a recent issue I have seen that other readers feel much as I do about all-electric sets. I wish to support J.M., Wapakoneta, Ohio, in his request for a two-tube all-electric set. It so happens that I own one of these sets. I find that it can do wonders for its size. As I have said, you have been doing fine along the allelectric line, and I am all for it. By the way, you might also put in an article shout repairing typewriters. You'll notice that mine doesn't print the tops of the letters plainly. Hal-R.Y., Smithville, Ohio.

#### Wants to Make a Sloop And Cruise Four Years

Asour the suggestion of J.P., Lafayette, Ind., anent the building of a twenty- or twenty-five-foot sloop. If you were to publish plans of such a boat I would appreciate it quite a lot. I am at present and have been traveling around the West some but plan

eventually to land back in L.A. I have read Harry Pidgeon's book about his four year cruise and have a desire to duplicate his performance with a boat just as large or slightly larger than his. May I mention, in passing, that I have not missed more than two issues of Por-ULAR SCHNEE MONTH-



LV in the last three years? Perhaps one of these days I can be enjaying myself at sea in my sloop thinking of you all at home.- R.S.L., Lead, S. Dak.

#### Some Drivers Think They're Cowbous Herding Cows

In a recent issue, R.A.S. says that truck drivers are ideal drivers and that Fred Frame is all wet. R.A.S. apparently has not had enough experience to tell a good driver from one that merely herds a cur. Fred France's rules are very fine, if you disagree with him. To be safe, just keep driving the opposite of what he says. As for truck drivers, they are road hogs, first, last and always; and a road hog is never a good driver. My state produces good drivers. I don't say this because I am egotistical and think they are more talented than others, but because narrow, unsurfaced mountain roads force them to be.-WK., Rockvale, Col.

#### Vouches for Hoop Snake: One Chased Him, He Says

I mave been a reader of Popular Science MOYTHLY for a number of years, and note in a letter from E.P., Bloomfield Hills, Mich., a reference to the "hoop snake" which some people say never existed, and others may now is entinct. I suppose there are really not many

snakes of this kind, but tell him not to fool himself, for there were snakes of this kind. Fifty years ago I was fortunate to have the pleasure of having one fol-low me and I was not long in getting away from him. As I was going to the barn to feed the stock, I happened to look back, and there he



came rolling after me. I got out of his way without wasting any time, I can tell you. He went into the burn and I called for help. He measured about six feet.-J.A.McK., Jeffer-

sonville, Okio.

#### Aims to be a Cut-up But a Scientific One

I am interested in experimenting with guinea pigs. I would, and I am sure many others would appreciate articles on this work. Tell us how to make a cheap but efficient dissecting board, also how to make a sterilizer for instruments, and what kind of instruments to use in dissecting. By what means could a specimen be kept fresh?-L.R., Spring Valley, N. Y.

#### Yes, E.S.S., but Running Suits Don't Have Coat Tails

IN REPLY to LS.H. of Philadelphia concerning his letter relative to speed and time required to encircle the earth; in my estimation the speed of his brain should be increased sixty times to make it function at the normal rate. By increasing his calculated speed per second by sixty, he will obtain distance covered in one sixtieth of a second, and not zero time, If L.S.H. could reach his desired speed, he might see his dust at the starting point but he couldn't grab his coat tails. Incidentally,

has he done anything about figuring out his stopping ratio? He might need one .- E.S.S., West Cornwall, Conn.

#### Who Wants Half of a Horse Anyway? Half of a Man?

HERE is a problem for some of the other readers. I hope they won't have too much

trouble solving it. It isn't any too may, A man had three sons. When he died, he left seventeen horses for his three som. One of them got one sixth of the horses; shother son got one third of the horses and the last sun got one half of the horses. How were the horses divided so that



each son got his allotted share, without breaking a horse in half?-R.B., Bowers, Pa-

#### J. M. D. Likes His Hydroplane Made from Our Blueprint

ABOUT a year ago I got from your blueprint department, plan for the hydroplane "Scram". I wish to compliment your designer on that plan; the boat certainly works like a charm, even though my work on it was far

from being perfect.

I would be very much interested in seeing an acticle on racing Buids, for outboards. I have heard what they are made of, but have never seen the formulas. Also, I have read that good drivers can make a boat jump into the air, as far as thirty feet and as high as eight. How is this done? How about an azticle on streamlining a bull? This is what they are doing most now to speed up the hulls, according to an article that I read the other day. Here's to your good work and a good magazine. Keep It up.-J.M.D., Pelican Rapids,

#### Paris Reader Writes of Mystical Cure for Snake Bite

CITEBERT throughout India is a belief that a certain creature called the Nag has in its head a jewel-like object such as was once reputed to be found in the head of a toad, that sucks up the poison of the deadliest snake, if it is immediately applied to the wound. The

sophisticated or the cynical might think this NOW BOUT THE story incredible, and yet, strangely enough, in 1020 the collector for the district of Wadhvan stated in his official report to the British Government that a Parsi gentleman pos-sessed this precious jewel and by it saved the lives of many natives and also the lives of some of-



ficials working in the jungle. A ruling prince of India is said to have offered thousands of rupees for the jewel, but the sauguitude of the offer made no impression upon the Parsi, a gentleman of considerable personal wealth himself.—S.S.C., Paris, France.

#### If You Prospect For Gold Here's a Chance for You

As a purchaser and reader of your publication, viz., Portilar Science Monthly, since its existence, I respectfully ask if by chance some reader of the Gur Readers Say section

run advance a hint on how I might solve the following problem. Last spring my ring florer becames wellen from ivy potsoning, consequently I transferred the ring to the next finger which was a little too smaller the exceptionally heavygold-studded ring. Motoring along a road



near my home. I waved my hand to a neighbor, and the motion of my arm caused the ring to slip off into the brush along the road. I have made minute searches, but thus far I have failed to locate it. I know it is still there, and that nobody has found it, for if anyone had, I believe I would have heard it, all right.—G.C.X., Whippany, N. J.

## Fish Take Life With a Pinch of Salt

I stave found a very good kink for fellows who keep father in aquariums, it is to add a small quantity—just a pinch or so—of said to the water every two weeks. This dose of medicine w—keep the fishes healthier, because most bacteria cannot grow very well in slightly saidsh water I have had my aquarium now for turce years and no father have yet died of disease—Al K., Chicago, I.,

#### Botanist Who Knows His Onions Can Win Fame

Pantars some botanist who knows something about breeding flowers and vegetables could work out a method of combining those two delectable ylands of the table, the olion and the radish. As for me, I am a farmer to whom the coming of spring means a lot of hard work and also a lot of big earing and especiarry I look forward to the appearance of green ontone on my supper table, and little zed radishes. If some genius could only combine the two he could get famous avernight as the first to grow the radion, or perhaps it would be the onyish. M-m-m-m! I can smell how good it would taste, with fine homeznade butter and crusty bread right out of the oven! I tall you I wouldn't awap a meal of onyishes of radions of whatever we are going to call them, for any of those fancy city dishes with the long names. My I I must be a mite hungry. I guest I'll go downstates and peck around a bit .-- C.H.H., Califoo, N. J.

#### Cry for Help Comes From Snowbound Saskatchewan

AM a regular reader of your magazine, and like it fine I have been scanning its pages for some time, hoping you would give us an ar-

Being unable to use a car between December and April, on account of heavy snows, I think a lot of people up in this section of Canada would benefit by an article of that nature to provide them possibly with a means of getting around during the winter for business and so-



cal purposes, such as calling an our neighbors. Certainly we could use a snowmobile..... O.O., Kimistino, Sask.

#### Workers in Hot Lead, Do You Know This Secret?

A H.A. of Egg Harbor, N. J., asks how to prevent melted lend from splattering. I be seve his trouble is due to mosture in the crucible. The crucible must be preheated before starting to melt lead. Any cold object will sweat when heated. This moisture when mixed with mested lead, will cause the lead to splatter. Hat lead must never be poured into a cold mold of you want to avoid trouble and possible interv. G.T. Berkeley, Canf.

#### Barefoot Boy of Years Ago Had Grand Time Afield

RELATIVE to snakes swalpswing their voung I have just read two setters on the subject one from W.P.A. of Arkansas, the other from Mrs. J.H.B. Bakersúeld Vt. Some scout the idea as contrary to reason, but I am in the positive side of the argument. Born on a farm to Jacksonville VI | roamed the fields as a child, ake all farm chadren, unta I was tweive years old. One day when I was ten or eleven years old, which would be forty fine years ago, while playing in he apple on hard below the house. I nearly stepped on a very small snake. As I moved toide, I saw another one then, suddenly I was aware there were many butle (et swy all around me Heing bare) foot and easily surprised by strange objects underlant I jursped under and turned and gooked at them. I saw an old snake a com-

mon harmless streed one its mouth wide open, all the little snakes crawled into it it got away while I was looking for a stick or stone with which to kill it I destroit a remember the ocident the old tree and the bor way pear by leading to the ber ry fot Several years.



ago while looking over the farm. I saw the very apple tree and standing under it mediated hims over again those happy youncer days bome of the granifest times I ever had, I enjoyed as a harefoot boy in the country. B.44. Brattieboro, VI.

#### Much Obliged, R. K.— We're Glad You Think So

It may interest you to know that having read most of the mechanical scentific magazines no the market, I have turned to Port-LAR SCIENCE MONTHLY exclusively It certainly is one swell magazine. I especially like the radio and aviation articles. Keep up the good work.—R K., Angola, Ind.

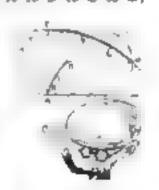
## This Microscope Fan Wants To Build a Telescope

In Oth Residen Say I just read a plea for somethics on amateur telescope mirror consecurition, and it affected me so much that I thought I would write in, in argent support IN of Coeur d'Aiene Idaho, has put into words something that I have had in mind for a long time, something which might do the seemingly impossible—improve my favorite magazine It has just about everything may laurets go to the arricles on the microscope but here's one tituten who will exhaust his superlatives when the attickes began to come on making mounting and using say a four to us inch redecting telescope. But please don't make it cost too much, the more of the work we can do for ourselves, the happier well be Here's thanking you for all the dele his you dish out every month I am much interested in the opportunities such a plan as I have brought out would give readers all over, to watch the stars. We could then make ourselves planetariums, too, to add to our pleasure as astronomers. Let us do most of the work.—E.Y., Wolfville, Nova Scotta.

## That Wheel Problem And Two Theories

The question of HWM, of Catasauqua, Pa, interests me very much. He asks "Which part of the wheel travels furthest?" I am enclosing a diagram and my explanation. As point one travels from A to B to C to D,

point seven travels from E to F to G to H The wheel has made one quarter of as revolution on road XY. It can easily be seen that the locus of point seven is longer than that of point one However, during the next quarter revolution, point one will travel a distance equal



to locus EH, and point seven will travel a distance equal to locus AD. Thus, on completions of a half revolution of the wheel, both points will have traveled equal distances.—D.O.V., Kingston, N. Y

To solve the wheel problem, cut out a six such disk. Punch two holes near the edge, to represent A and E. Hold the disk by a natithrust through its center. Then roll the disk along the baseboard, and hold a pencil point without slipping, in one hole, so as to draw a curve indicating its path during one revoluting. Then perform the same action helding the pencil to the other hole.—A.V., New York, Y.Y.

## Do You Think This Gasoline And Steam Engine Would Work?

Is vuts idea practical? I should like the oranion of readers of Por LAR Schner. Misself w Remove the cast-gon manifold of a four-cylinder automobile engine, and replace it with a manifold of copper. Around this fit a boiler about seven inches in diameter. insulated, and containing in its top four small niectors such as are used on I iesel engines The njector pumps are to be operated from the care staft. Under compression, the exhaust manifold would get very hot, and act as a dry, flash-type boiler, when the injectors sprayed water upon it. To the front of the ename we would add two evanders, lit ed with valves to use the steam generated by the boyer The trankshaft would be at right angles to the automobile engine. The two steam intions would give namer on early down stroke with entire principle, the strong bases and power of an eight-cylinder engine on the fuel consumption of a four-cylinder engine,-A.M.C., Port Angeles, Wash

#### Philosophers Have Racked Their Brains On This

With can't man control time? That is the question that arous in my mind the other ought as I read an adventure story about a man, who, through the me of a machine of

his own invention, could wander among the centuries of the past and the future. Of course the idea on the book was rather hidden, but at least it got meth uking Apon. I say why can't man control time? I wish some of you genuses would get to work on the problem Although I have taken this mag-



TUDGA TAKW

azine for only three of its sixty three years, I think I can say that it is was and shan be, the best on the market.—J.R.G., Berwick, Pa.



#### CHEVROLET (Manter be Lune), PONTIAC and

#### **OLDSMOBILE**

Closed car models for 1835

As THE largest makers of automobile bodies in the world, we have been working for years to perfect a safety roof of solid steel for closed cars.

No one until now ever succeeded in this and it was no simple task. It meant not only the drawing and forming of rough mutal in unprecedentedly large shorts, but the designing even of the huge special presses to handle the steel.

Now, however, we are able to announce the complete success of this effort - in the new Fuher "Turrer Top" closed bodies.

These bodies put over your head a safety armor of beautifully contoured said steel, steel braced with steel like the modern bottleship turret from which they take their name.

Even the steel roof is supported by steel-roof-bows and is welded to the other steel body panels.

Quiet, rugged, true, there is no rumble, drum or rattle—and you are protected from extreme seasonal heat and cold. Complete scientific insulation against both sound and temperature was achieved after years of work in the laboratory,

testing on the open road, consultation with car owners and

eshaustive experiments at the great General Motors Proving Ground.

And the traditional sys-satisfying beauty of Body by Fisher is actually subsuced by the smooth, flowing, unintercupted line of this modern roof.

There are many other worthwhile improvements in Body by Fisher for 1935 too — such things as full streamlising, more luggage toom, windstream V-type windshield, wider seats, more headroom, bigger doors —

And, of course, time-tested and conver-approved Pisher No Draft Ventriation—more highly perfected, more efficient, more expertly engineered than over this year.

But the biggest improvement of all is the new Fisher solid steel "Turvet Top"—now featured on the 1935 Chevrolets (Master De Luxe Series), Postiacs and Oldsmobiles—and found, like Body by Fisher, saly on General Motors cars.

THE New "TURRET TOP"

This is the way the new Fisher "Torret Top" looks -- a magic seaming theret of tough drawn steel, steel

reinforced with steel take a battleship rarret. The "Turret Top is better looking, atrouger safe with the safety of solid stret. Equally important, there is so camble, drust or cards. After years of work and

experiment we have developed a top that it not only

insoluted against sound, but that protects you from

aummer's beer and winter's cold as well



BODY BY FISHER # GENERAL MOTORS CARS ONLY: CHEVROLET - PONTIAC OLDSMOBILE - BUICK LA SALLE - CADILLAC

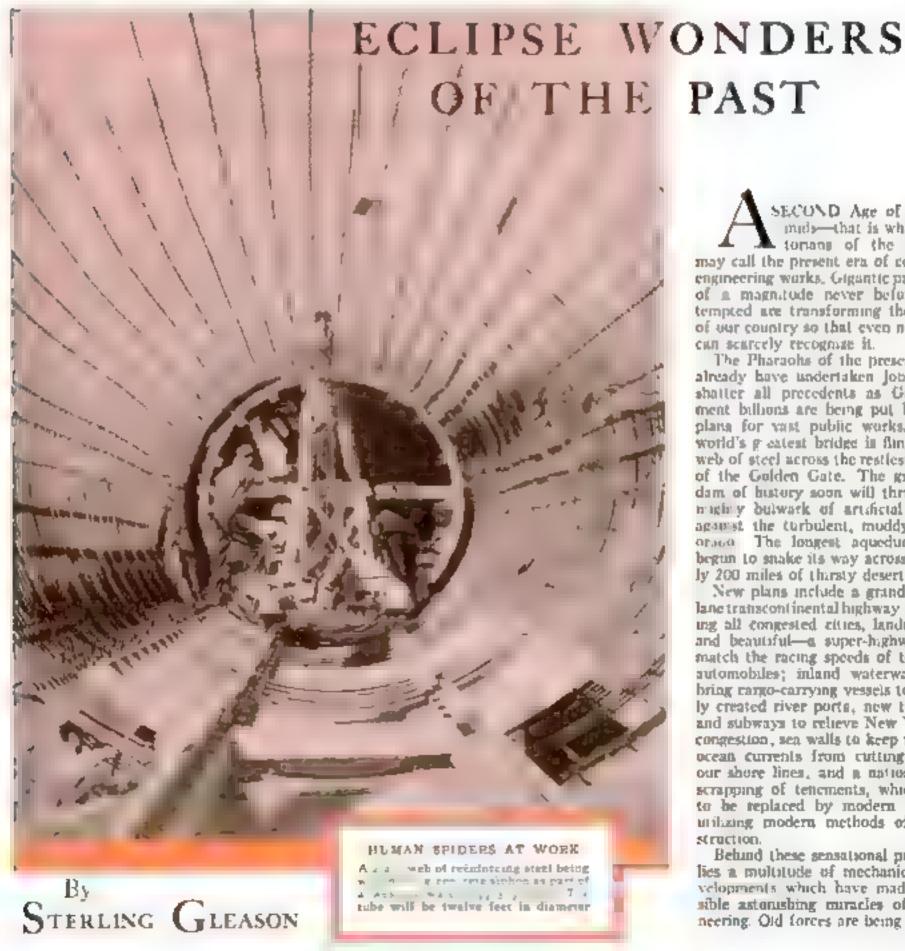
# POPULAR SCIENCE

APRIL 1935

VOL. 126 No. 4



# Modern Engineering Feats

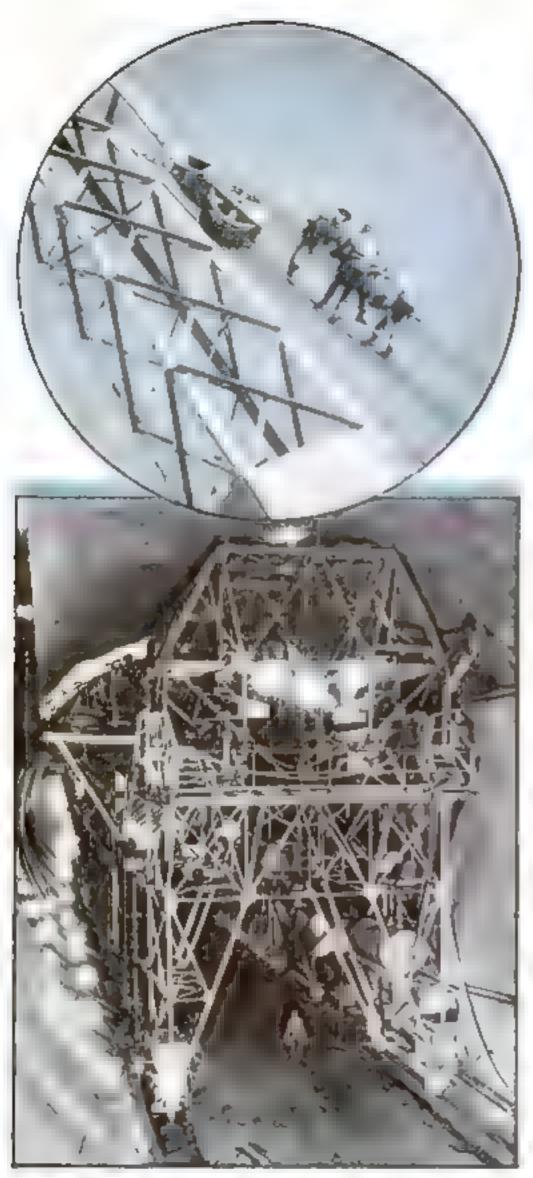


SECOND Age of Pyramids-that is what histomans of the future may call the present era of colossal engineering works. Gigantic projects of a magnitude never before attempted are transforming the face of our country so that even now we can scarcely recognize it.

The Pharaoha of the present age already have undertaken Jobs that shatter all precedents as Government billions are being put behind plana for vast public works. The world's g catest bridge is flinging a web of steel across the restless tales of the Golden Gate. The greatest dam of hutery soon will thrust its mighty bulwark of artificial atone against the turbulent, moddy Coloraco. The longest aqueduct has begun to snake its way across nearly 200 miles of thirsty desert

New plans include a grand fourlane transcontinental highway avoicing all congested cities, landscaped and beautiful-a super-highway to match the racing speeds of today's automobiles; inland waterways to bring rargo-carrying vessels to newly created river ports, new tunnels and subways to relieve New York's congestion, sea walls to keep unruly ocean currents from cutting away our shore lines, and a nation wide scrapping of tenements, which are to be replaced by modern homes utilizing modern methods of con-

Behind these sensational projects lies a multitude of mechanical developments which have made possible astorushing muracles of engineering. Old forces are being put to



Walls of immune tunnels are comessed by the use of huge concrete gue carriages like the one shows above. In the carrie at top of page, riggers are working on a manamoth exam on a construction job

Vast Public-Works Projects Are Transforming America With the Help of Amazing New Methods and Machines new uses; new forces are being created to perform tasks that would have been impossible under former methods. In their relentless drive against natural obstacles, engineers are applying mechanical agencies in hitherto unbeard-of ways.

Droning vibrators now rapidly agitate concrete as it is poured, causing it to settle compactly and to harden

better and stronger

Long explosive bombs are burrowing boles for foundations of the Golden Gate bridge at San Francisco. Casti Hydraulic "knives"—jets of water under tremendous

pressure-magically slice away billsides

Robot bricklayers erect walls at three times the speed of human workers, concrete is shot from guns to create smooth surfaces of artificial stone, giant road-making machines now move almost with callike trend because balloon tires and featherweight metals make them smoother and lighter.

Concrete, favorate building material of the modern age, is finding new usefulness through chemical magic. Chemists can now produce a concrete for any desired condition, by prescriptions which govern the nature and mating of the ingredients. It can be made hard as stone, especially resistant to water or light and perous. It can be made quick-drying, quick-setting, heat-insulating, or

sound-absorbing.

Huge trucks with rotating chumlike bodies now speed to big jobs, mixing concrete as they go. Vibrating the mixture at high speed improves its quality, reduces honeycombing, makes it settle better, and saves cement. In hig masses, as in huge dams, ordinary concrete would require years to harden completely, but new formulas and methods of curing reduce this time to a negligible period.

Where a uphon of the new Colorado River aqueduct goes over the crest of a mountain under the broiling desert oun, the outside of the concrete pipe is fifty degrees hotter than the inside. Artificial fog applied to the concrete as it hardened, cured it so well that even under

this terrific heat strain, it will not crack

Completely cast in concrete, many new buildings are virtually monolithic, as if bewn out of a solid block of stone. Yet by spraying cement under high pressure onto plastic forms, which later can be removed, they may be beautifully ornamented with intricate designs, reproducting the finest work of artisans.

BRICK construction is speeded by a new device, turned by a crank, which spreads muriar so fast that one man can lay three times as many bricks as he can't with not the

Just the moving of earth on a mammoth scale is another important phase of engineering advance. Huge buildozers which by brute force simply nose big piles of earth ahead of them, showe new highways across the land knormous "hugges"—chariothke steel carts, holding thatty cubic yards at a load—move earth in the building of the All-American canal on the lower Colorado River. Each burgy" has great soft tires like balloons, almost as high as a man, and discharges its load at the rear without lifting

A new one-man "buildoser", gouring its way along the mountainside, gashes out a twelve-foot highway, by

means of a special angle-biade

The whole top of a western mountain began to melt away as engineers turned the nozzle of a powerful hydraunc gun on its summit. The mountain was slashed away to lower the grade 600 feet for a new road.

Seaguing tractors run on the ocean bed along the Calforms coast. Dragging scrapers, they plunge into the
surf and bring up sand to build a new link in an important highway. In another aquatic project, a buge grader
with wide tires to traverse soft mud, circled round and
round a submerged island in the tenter of a lake and reconstructed the entire share line on a one-to-three slope
to provide a smooth bathing beach.

Even the common machinery of big-scale construction has been transformed as modern engineering has made them more efficient. Greatning new dump trucks have bodies made of aluminum to reduce the dead weight Aluminum also lightens the booms of cranes and the buckets of steam shovels without reducing their strength.

Aur-inflated rubber tires like those of automobiles appear on wheelbarrows, on tractors, on graders and road mach nery. Balloon tires, carrying forty pounds of air, were put on wheel acrows to deliver concrete for a new hullding in Chicago. The barrows rolled along smoothly without jur and did not deface tile fluors, they eliminated the need for planking. The strange sight of trucks driving into the 1. Supreme Court Ballong was seen in Washington, D. C., the other day, as trucks drove up a ramp into the main entrance to unload markie and other heavy materials made.

New metals from the laboratory are aid as in countless ways. A new alaminum, strong as steel but far lighter forms a new skeleton for a fifty-one-year-old Patisburgh bridge, removing 750 tons of dead weight from the old structure and extending its life an estimated award-five years. These tons are equal to the average weight of the teatherth will pass over it. Had the new aluminum been discovered sooner it might have cut millions of dollars from the cost of the new Gotten trate Bringe, by snaking 1.

All MINUM Al LOV bars in the hands of workmen of en the work of stripping forms. Monel metal tubes in the Hoover Dum will forever dely rust and cornection, have been dratted from the laboratory struction. To prevent flaws in weiding the natural struction, To prevent flaws in weiding the natural struction of the form of the natural struction.

tip health. Is where the tunnels of the witness to keep aquedact are being forced through the content are automatically sharpening to the critis at so rapid a pace that they have already treaterills thun had ever before been sharpened to all engineering history a corchag to machinists.

In a large sceel pipe line, it was found that the hot summer

sun made temperatures inside to the we does who bad to do their work track to come the exterior with white pant remided the temperature issue by fifteen or twenty or press

Workmen's lives are some guarded by countless new safe ty devices. Men wear steel hel mets ake the worst me "he hats" to protect their heads against falling make or rivels



from the say to be a sign as one are the way to be as one away to be as one away to be as one



The second secon

The are on figures of the state of the state

or ing clothing and safety be to have their place Scattending of steel prevents danger of falls in high construction work. Such a web of steel crepq he face of the Washington Manament recenty when the hage shall was given its first closs ing since its completion in 1854.

More than two mics of tubular scaffo ling with tolid planted his ways six feet wine blis somed over the while

ortace of the J. W. Robinson store in Los Angeles, as workings on sixteen sevels gave be while building a new face. Concrets shot from gues at a pressure of 100 pounds to the square each, formed a whole new exertor wall. Business went on as usual while special precautions prevented quaterials from talling on people coming and going in the streets below.

Life preservers in the form of safety vests are worn by all workmen on the piers of the San Francisco-Oakland bridge to reduce dancer of drowning in the rough waters of the hav below. To and from work the steel erectors ride up and down on the high towers in clevators at a vertical speed of 100 feet. I minute. The cases are enclosed by wire mesh to prevent accidents.

As our lines rapidly push on toward the bullet speed of 250 miles per hour, land transportation also moves faster. Cars traveling at rating. (Continued on page 1 %)

# MOTORSHIPS OF THE SILK World's Greatest

ROM a New York as k dealer to a factor in Yokohama flashed this urgent cablegram the other day "Rush 800 bales white aik next

At the moment, there stood at a Yokohama dock the Nagara Maru, one of the newest members of the sick fleet, consisting of fifty fast motor freighters constructed during the last five years to speed delivery of Japan's silk to the United States. Her funnels belebed smoke, as seven gangs, working with overhead slings and through ports, poured cargo into her houts

An hour after the message reached the Japanese dealer in row sitk, two additional games were engaged in storing the valuable. bales into the si'k rooms, fined with steel and cork-dust walls and paneled in soft wood,-proof against water, fire, dust and

vermin. In a few hours the last bale was braced atop soft-wood gratings and against the bulkheads, locks were snapped shot, and the speedy freighter turned her sharp prow eastward for a non-stop race of twelve days to Los Angeles, 4,839 miles

From Yokobama or Kobe, nearly every day, ships of the silk fleet sail, with their valuable and perishable cargo. They cross the Pacific more quickly than passenger iners, to Los Angeles, San Francisco, Portland, Seattle, and Vancouver; there, with a speed shown by no other international cargo-carriers, the silk is transferred to baggage cars attached to crack passenger trains for the final dash across the continent. Within sixteen days from the minute the doors slide closed on a silk caego in Japan, it is in the hands of its American purchasers in New York or Chi-

Until five years ago, most silk moved across the sea to the United States in freight and passenger steamers which often louched at several ports, on the way. Then the ship destined to be the forerunner of the scientifically constructed and iast motorships—the Kanas Mara -made her maiden trip from Yoknhama to Los Angeles. She completed in eleven days a voyage that took must of her predecessors

> twenty-two days. Then started the race to construct the "talk ships," They carry

all manner of cargo, besides ailk. They operate under the Japanese flag, for a half dozen leading Nippunese shipping firms. They have speed, they have excellent facilities for handling silk safely, and they have a long cruising range. Although the fleet now includes a half hundred vessels, even more ships are on the ways, and in a few months will join in the

silk race

The newest ships to join the fleet are the Nagara Marn, Noto Marn, Nako Maru, Noshiro Maru, Naruto Maru and the Norma Mara. Each vessel displaces 9.000 tons, and can cross the Pacific in eleven days. In early trials they attained a speed of eighteen and one half knots. To aid in achieving speed, each has a compact bridge amidships, with detached forecastle, bridge, and poop decks, a crulser stern and a streamlined, balanced rudder All the vessels are propelled by sevencylinder Diesel engines.

These new ocean carriers are said to be the safest ever to transport cargo. They were completed and equipped according to international specifications laid down by the Japanese, British and American Insurance and government bodies. A ce lular double bottom for fuel oil and ballast water is carried throughout the length of each. The hull is subdivided by eight water-tight bulkheads. All of the engineroom auxiliary apparatus and deck machinery is electrically driven.

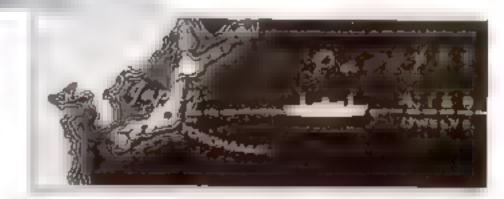
The at k rooms are in a hold immediately aft of the bridge. Chance of damage or destruction is minimized by minute precautions, from sirel batch covers, to a smoke-detection panel at which an officer stands guard constantly. Air is drawn from all holds through small-bore pipes and carried to the smoke-detecting cabinet in the wheelhouse. By merely turning a lever, the officer on watch can shoot carbon dioxide gas, through the same pipes. to the place of an outbreak

In the designing of few ships have such efforts as these been expended to speed the vessel through heavy seas, and to (actitude loading and unloading, also, When a cargo of, possibly, 8,000 bales of silk is added to a beavy load of general merchandise, as many as nine gangs pour

raw and manufactured goods into ber

TIFTY fast freighters ply the Pacific at express speed with precious cargoes from Japan to help American manufacturers meet the growing demand for silk products

By Andrew R. Boone



Map shows the path of taw wilk in its race from Japan to factories on the

In the photograph

above. a .hworms are

guen ford of an thus berry leaves. Right

women sort og the coccone before they

ers boiled Boiling

sultant h sments so they can be drawn

easily into threads.

# Sea Race

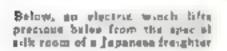
bolds, seven from the wharf and two from lighters drawn alongside. Nor does the fast pace slacken when a silk ship reaches an American port. An electric warping winch aids in hauling the vessel into the dock. Eighteen cargo derricks help in unloading quickly. Special cars stand ready to receive the ailk

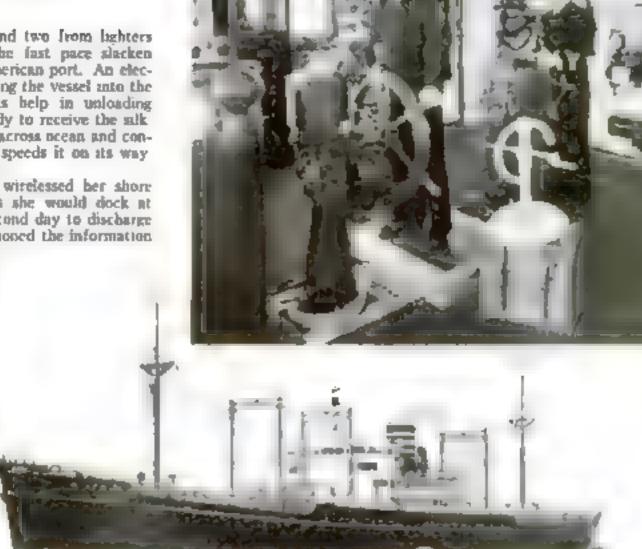
Although silk moves silently across ocean and continent, a far-flung organization speeds it on its way Suppose we follow the route

Suppose we follow the route

Recently the Nagara Mars wirelessed her shore representatives at Los Angeles she would dock at eight on the morning of the second day to discharge 200 bales. A traffic clerk telephoned the information

to a railway agent. Telegraph instruments began to sputter. The superintendent at San Francisco was informed of the movement; the dispatcher at Los Angeles received the message, a vice-president at San Francisco tead the message and arranged an insurance policy, the superintendent of transportation scrutinized a copy and accanged uninterrupted service to Chicago; special agents—railway detectives—from Los Angeles to





P cture at tup shows the bridge of one of the a drawn a Above, the Nagara Mara a recent addition to the Japanese alle fleet





other aids of the earth. Past ahips and express trains beet ordinary pussenger achedoles

New York read the message and prepared to be on band when the scaled shapment passed through their towns; an attorney for the ratiroad visited a customs office and obtained an advance permit for the valuable bales to move through customs without delay

Meantime, workmen inspected the baggage car because it must be mechanically perfect. They pulled out all protruding aplinters, papered all windows to hide the bales from currous eyes, and to make the car dust-proof. When the car reached the dock side, engineers inspected it a second time and tested the brakes to make sure the car would reach New York without breaking down.

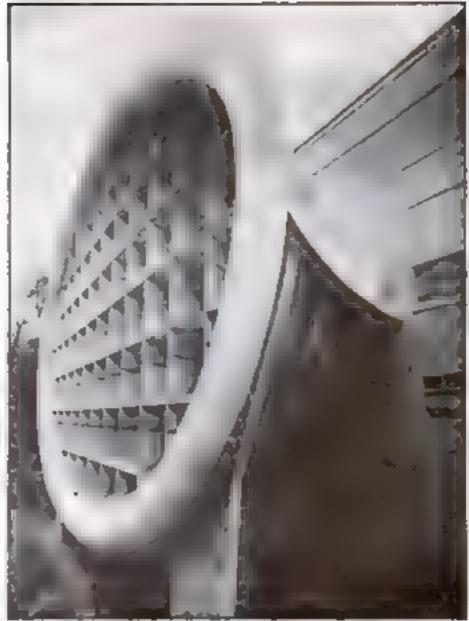
As the ship warped into the dock, stevedores poured aboard. A few minutes later, electric motors began to lift the 140-pound bases from the silk rooms and to lower them on to the wharf. The customs attorney watched over the transfer from ship to wharf. An officer wearing the insigna of Uncle Sam's customs service—guarding against possible smuggling—periodically broke open a bale and examined ats contents.

Other hands delily sewed up the cettonlined rattan bales. An officer released them to the railroad. Workers, pushing two-wheel trucks, tolled the bales into the car. An inspector, having checked the cargo, ordered the car closed and locked. An electric engine, standing ready eased the car off the side track to the main line. (Continued on page 105)

## Hurricane Tunnel To Test Real Airplanes

A DOZEN men standing on each other's shoulders would barely reach across the intake of an immense wind tunnel now nearing completion in France. At the opposite side of the testing station, a battery of round openings expels the air Half a dozen huge propellers will pull a hurricane through the big tube when it is completed, enabling engineers to study the behavior of full-sized planes under actual high-speed flight conditions. Whereas most wind-tunnel experiments are conducted with models, the new French plant will test actual planes.



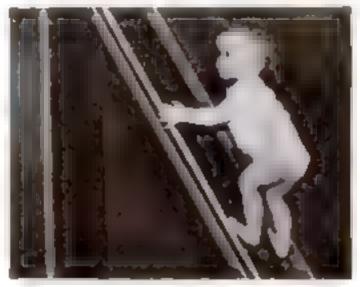


I she end of commune Prench wind tunnel for trating real airplance under fight cared, or left, testing exerson from the oil, showing general arrangement

#### TESTS SHOW HOW BABIES LEARN

It is he was been as being studied h New York ps hologists, who ger to had sup incline, leap and a last platform into har war as aman, use roller ory games. Her to the second trainreq reserved unfant. If a seems a real a newly acq: 3 3' v me of the psycholo-to worry the consulty temto a sale an result of the in a sering other new The case nehts give psyroach to the age-

old problem of the relative imporlance of beredity and environment.



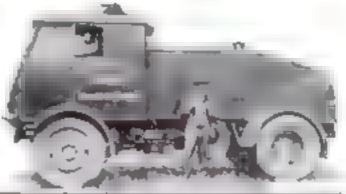
This filteen-months-old girl, who has been specially trained by scientists, climbs areep Incline uneited

#### Chapse the openings to discharge and of tunnei behind which giant propeliers will which

#### TRACTOR PULLS AFRICAN HAY TRAIN

Driven by steam, a curious tractor, built by a British firm, has just been placed in service in Rhodesia, to haul a train of six traders laden with hay. Gasoline serves up appearance of the odd tractor is shown fuel for the steam botler, and the fuel tank. In the picture at the right; below, the constitutes almost the entire body of the train that it pulls.

truck, because the tropical country is wild and sparsely settled and refueling stations are a long way apart. The





## Safety Tube Ends Blowout Peril

studded with satement sink a laid in its path, raced a sedan at fifty mucs an hour. With two secure to ports, he let, front and rear tire, then our-such a mishap as might or occur only in a motorist's righth ---the car did not swerve Its occut no jo . Instead, the machine with tered tires coasted to a safe and a - 4 42 as the driver leasurely slackened power and applied he brakes The Life tracks of the snow-covered, slippery runway in 1 ----Bennett Airport, New York, where the spec acular demonstration was at a conother that might have been draw. . . . . . ra er for heir straigh ness.

The occasion was the first public demanstration of the atest ouvance in auto safetya re tube that can undergo o rea, blowout without throwing the car out of control and impenling its riders. The tube consists of an inner and outer nir chamber, interconnec ed by a single tiny vent hale When he outer chamber is pierced and its air escapes, the weight of the car simply drops upon the inner chamber This chamber loses its air very slowly through the vent hole, virtually trans artning a blowout into a slow seak and giving a driver ample time to bring his car to a stop before the life goes completely flat

This has been demonstrated by as a







#### EXPERIMENTER DRINKS "HEAVY WATER" AT \$5,000 A QUART

A scene to the saboratory where Prof. Kigos Hadsen produces 'keavy water The picture at the right proves that this strongs substance weight more than ordinary water. The quantity in the left-hand graduate is worth \$50

RISKING his life to satisfy his curiosity about "heavy water," Prof. Klaus Hansen, Norwegian scientist, secently tipped a small glassful to his lips and drank it. Attendants stood by with stomach pumps and heart stimulants, since no one knew whether the mysterious substance was barmlets or deadly poison to human beings. But the bold experimenter reported

no ill effects beyond a mild shock and burning lips. Now be plans to take an increasing dose daily to test its effect "Heavy water," discovered in America in 1931 exists in traces in ordinary water, and can be isolated by electrical and other means at a cost of \$5,000 a quart. It weighs onetenth again as much as ordinary water, freezes at a temperature nine degrees

higher, and boils at a temperature three degrees higher Its offect on living things, however, is still uncertain. The suggestion has been advanced that heavy water, accumulating in human tissues. might cause symptoms of old age

Prof Hansen takes the daring wep of drink ing heavy water." not hnowing how it might айтел вот. На ріапа to take an increasing amount of it each day

#### REEL KEEPS CORD TAUT

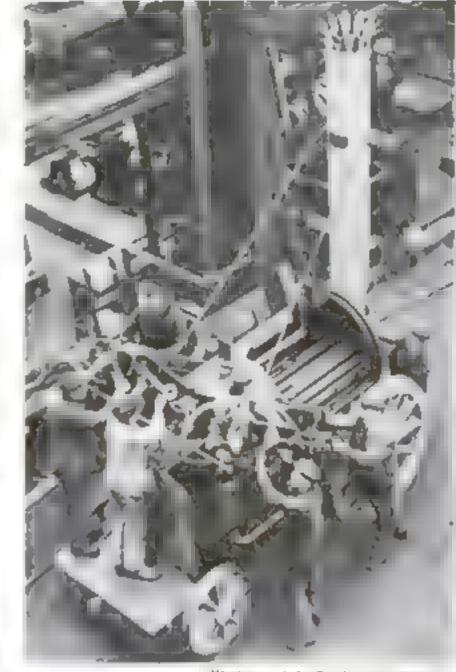
Unstantily lengths of electric cord trailing on the floor are obviated by the que of new wind-up reels. When a reel is plugged into an outlet and the cord has been attached and looped through a take-up slot, the slack is drawn in by turning the rim of the reel. Two reels can be attached to a standard double outlet, as shown above.

#### **AVIATORS FEED BIRDS**

Twenty thousand pounds of grain fell from the air recently over seven New Jersey counties, when eighteen planes participated in a bird-feeding program sponsored by a state sportsmen's association.

#### EARLY STEAM LOCOMOTIVE REPRODUCED

IN THE Stephenson locomotive foundry at Darlington, England, the other day, workmen laid aside the task of building mighty modern engines to recreate a proneer of the past. The odd order they filled was one from the Kensington Museum for a copy of George Stephenson's famous Rocket bund in 1829. The picture shows the historic exhibit nearing completion. But for the incongruous environment of twentiethcentury machines, it might not have been hard for the workmen to imagine themselves making ready he onginal Rocket for the trial, before skeptical milrood directors, that was destined to make transportation history



Workman of the Stephenson incometive foundry of Dark ngton, long and savember on of the famous Rucket by it by George Rucket

Dr W A Maddon of Lubbock Tex at work on our of his unusual pource on leather. He uses denta, contrainants



CREATING pictures on leather is the odd hobby of a Lubbock, Tex., denius Cowboys on broncos, knights an armor, and wild animals in their native haunts are among the subjects drawn upon for his novel craft. His first step is to make a freehand design on brown wrapping paper, transferring it with tracing tooks to dampened saddle leather. The design is then cut through the first laver of lea her. Hand tooling with homemade tooks fashioned from broken dental instruments, completes the design. To set off the figures, the artist dyes the background black.



## FOUR-MAN CAMERA TAKES MOVIES IN COLORS

Coton movies that rival the hoes of nature, made with a new camera that requires a crew of four men to operate it, are soon to make their debut before theatergoers. The camera, shown in use at left, exposes three films simultaneously, using one to record each of the three primary colors in a scene, A novel optical system, including a mirror flecked with gold, separates the color rays for distribution to the films. After development, a single combined positive is made, which is in natural colors and may be exhibited in an ordinary theater projector. The new process is said to give delicate gradations of color beyond the reach of two-color processes in which only a single color separation is made. It also avoids the color fringes seen at the edge of rapidly moving objects in some earlier processes when a single film is used to record the various primary colors. Color movies made by the new system will be introduced in the production, "Becky Sharp," a screen version of "Vanity Fair,"

## Aztec Temple Found Under Mexico City

NOTE NT an importem our ares to meaning by which exclusion valors presaring a founda-I all of a Plante part Piptos ser in the he or Marco to recen y soruck in Ar at tempt on a law out times ograph The ripo in the for NX A are the same was the hard of the wine then, to be a war no land for he work were had do no by and or A SECTION OF THE SECTION OF A SECTION TOUR DESCRIPTION OF STREET tel ar in a a real he will re-Harts of the same are severy BUT HE S SAIN IS FART II MA IN R IS I C Variable in the contract to the left.

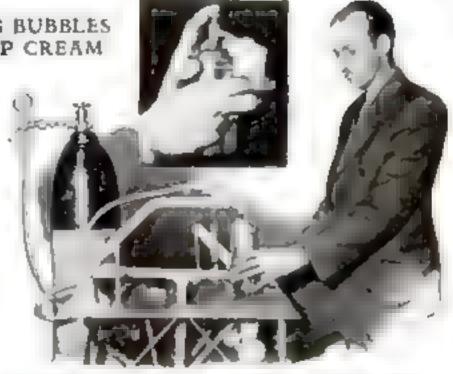




When a Action to a near the least the New ton State of all own to background. Left two atoms dragons' boads, temple of nemotics

## LAUGHING-GAS BUBBLES MADE TO WHIP CREAM

THE \*bubble meth od" for whipping cream has now been perfected by Charles A. Getz University of Hanots chemist after preliminary experiments described in an earlierissue Ordinary cream is put up by the dairy in airtight containers of automobile stee... resembling soda siphone: and nitrous exide an inert gas, is then injected. When the housewife presses a button on top of the contumer, bubbles of gas whip the cream and deliver it for use



How boutewife serves cream by pushing button to shown above in larger picture, chemist injecting yes into cream container

#### SNOW PLOW CLEANS WALK

A BABY rotary showplow, a miniature version of the type that railroads use, has aided its Oregon inventor in keeping his sidewalk clear. A small gasoling engine drives whirking blades that throw the bulk of the snow to the nide, as the operator pushes the machine along. The device made only a few minutes' work of the indewalk shown below.



Otegon inventor and his rotary anomplow for sidewalk use. Note ments of clear povement

#### NURSE USES TINY LAMP

A new type of flashlight bulb, no larges

a kernel of corn, has permitted the

afacture of a practical flashlight de
d smaller than anything of its kind

hitherto made. Resembling a

hitherto made. Resembling a small fountain pen, the flashlight is a convenient handbag or vest pocket accessory and offers a convenience to doctors and ourses as well as laymen because of its compactness. Left, a ourse using it foset, the bulb itself.



# Racing Drivers Lead

OME people call au omobile race drivers reckiess fools. But one of the most (among of all the speedway clan, grayhaired Ralph Del'aima who has sur vived well over twenty years of big-time racing, calls himself and his rivals "the gumen pigs of the automobile On astry "

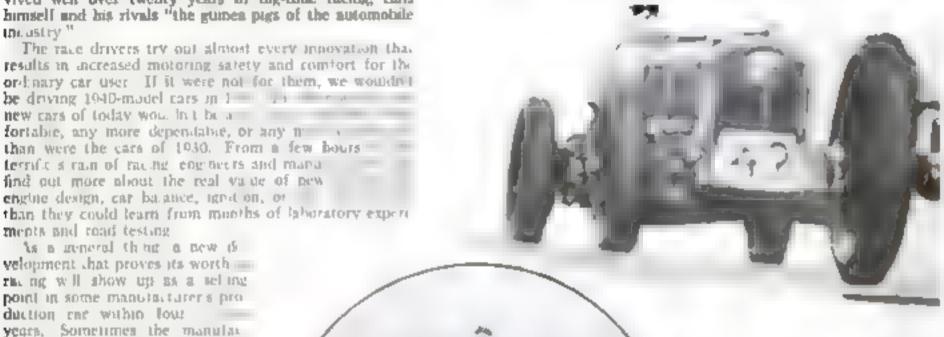
The race drivers try out almost every innovation that results in increased motoring safety and comfort for the or heavy car user. If it were not for them, we wouldn't be driving 1940-model cars in 1 new cars of today woo, in t be a fortable, any more dependable, or any move than were the cars of 1030. From a few bours terrific a rain of racing engineers and mana find out more about the real value of new engine design, car balance, ignation, or

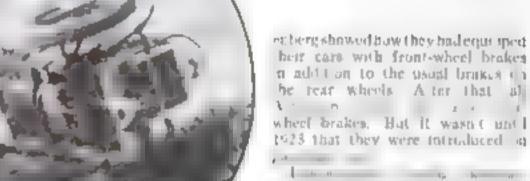
ments and road testing

is a general thing a new of velopment that proves its worth rating will show up as a seling point in some manufacturers production car within lour veges. Sometimes the manufacturers and much farther than that behind the speedway drivers. It was that way with four-wheel brasico s

stack in 19.5 spectators at the Eigin (III ) National Trophy Race were astomshed at the case with which some of the drivers took the aquare turns of the diri-road course after sunning up to the at a speed of eighty males an hou The are but these pilots were al wines the pacing team driving Duesenberg cars. After the race, Fred and "Aagie" Duc-

FROM THE ROARING ROAD COME NEW DEVELOPMENTS FOR COMFORT AND SAFETY





. . .

the second of track to the highway. They have 4 1 1 1 1 1 1 1 1 1 1 Ralph D sq a car (bal b) f and a second of the second Land a deposit a content of the project is expense.

In 1905, Arthur MacDona d a Hellsaws is preduction-

Florida. That same year Ford and Frank in otalt straight-man, preed a straight-eight Darracq over the Foorida was a lapse of several years before Fred Duesenberg true harman age and the second s thoroughly streamlined as is Sir Malcoim Campbell's new which he expects to drive five mues a minute Many of the less spectacular improvements that have , , h 

had to think of valve trouble. It wasn't always that way, as you will remember, if you have been driving for ten or fifteen years. The improvement can be traced directly to racing experience

One day in 1926, Frank Elliott, then a prominent



A tense moment in a Vandarbill Cup race. This classes of the early days of racing trught manufacturent many things about the building of automobiles. Rand races have special value as teste, simulating conditions of highway drawing

# the Way to Better Cars



speedway driver, held a bug lead in an important race. He had only twenty-eight laps to go, and as he streaked around the track be planned how he was going to spend the winner's end of the purse. Then a valve spring broke, and put him out of the running

Export cursed his luck. But he didn't stop at cursing. He got after the manufacturers of valve springs. On his insistence, they experimented be tested the results. I may be they changed the design and materials that produced the almost trouble-proof valves of today.

O's THE Indianapolis Speedway last Memorial Day Bal Cummings, the present national champion, won the blue-riboton event of American automobile racing the annual 500-mile International Sweepstakes—with an average speed of 104 86 miles per hour. But what interested the automobile industry in this race was the fact that Cummings bad used a newly developed fuel, not yet on the market, and that he had burned up only thirty-five and a half gallons of it in nearly five hours of 104-miles-per hour driving. An average of 14.1 miles per gallon of gasotine in a specialized racing cor! A consumption of less than a half pound

of fuel per horsepower hour—better than is claimed by the manufacturers of the most efficient aviation engines? These were test results that were highly important to the industry, and promise savings of hundreds of thousands of dollars a year to ordinary motorists in the near lature.

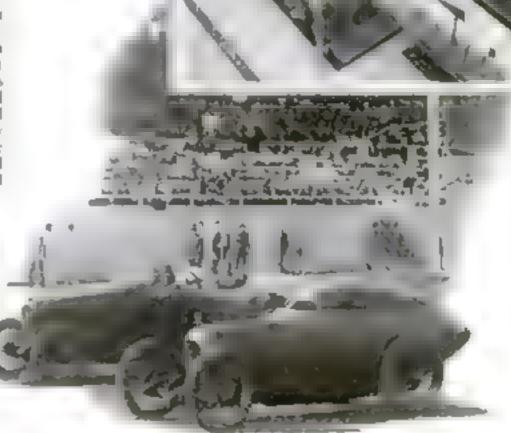
Each July, automobile racing men—engineers designers and manufacturers—meet at the invitation of the Contest Board of the American Automobile Association to frame the entry conditions of the next year's Indianapolis race so as to encourage development along useful and practical lines, and to test out results of research work. When the conditions for the 1934 race were discussed, it was found that greater fuel economy was one of the main objectives of the industry, and to encourage the development of fuels that would give this desired economy a fuel limit of forty-five gallons was adopted for

the race, as a valuable, purmed experiment

The results were better than had been expected. Not one of the thirty-three cars that started the rate was forced out by an exhausted fuel allowance, and of the dozen cars that finished the grind, the one that burned the most had two gallons left in its tank tummings used twenty percent less fuel than did the winner of the 1924 race—and he traveled six and a half miles an hour faster in doing it. To encourage further development along this line, the conditions for this year's race set a fuel limit of forty-two and one half gallons.

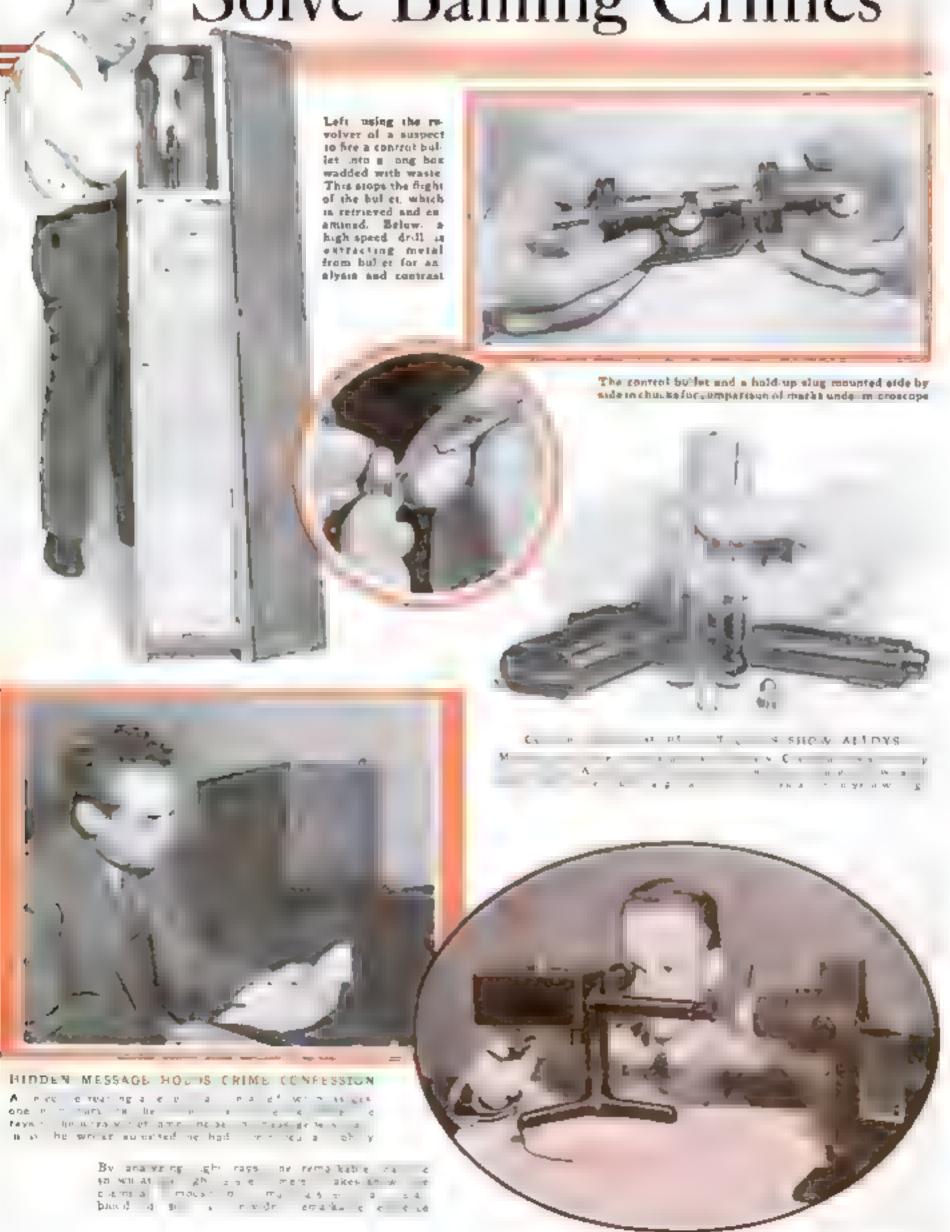
Race drivers didn't give much thought to their fuel until 1923. They used ordinary gasoline and let it go at that Theo it was found that a certain well near Bakersfield, Calif., supplied a highly volatile gas that developed more (Continued on page 70).





The accestor of the atrendiced passenger automobile. This bullet-shaped car was driven by Barney O-cheld in races at Sheepshead Bay, N. Y., many years ago, in a series of heats in which Ralph DePalma (in No. 4) defeated Oldfield and Chevrolet

# Black-Chamber Sleuths Solve Baffling Crimes





Be ow eratching he troy hules on the surface of a siedge harmout or particles of or 16. To a miles of particles particles as peculiar penetrating light

#### TRAIL OF GUNFIGHT DRIVER LEADS TO HIS BEDSIDE.

A se we ashe when the new and server a map of the head of the area but he never a measure of the head of the head



SMEAR of good pant make a seew prove in the present is a list of where a r he log great house wore a larg tr I proper the back court by an the original a superior by a karpoot and I the a kabinar a se las las con poli-HOLD A LOUNG THE AND A SHOP OF A SALE AND A SALE OF A SA or Lieu H t \ quarter queries queries appropria Mr West of HERWALTER LES IN the Hall for the of a notice special sector of the a left to aden has harden to be a low a till to be s the area of the street of the little there was the state of the press. To apart the possible of a contract of a record of the contract of the contrac A F B 4 mg 'F F B A FG 4 F G F Ex SZ K I L A IN D K S M L C C M h · r 4 - r 4 - r 4 term for the annual state of A d I s he f s ft sfue to the file hande to be a first of the second y see e e e t with to the liberty of p the property of the state of th With I wanted to be at s in the second



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## Sculptors Restore Face of Early Man



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The state of the s

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CCURATE likenesses of people who lived hundreds or thousands of years agn are being created in aculpture through an ingenious process developed at the Natural History Museum of Vienna, Austria. The resulting busts depict prehistoric men in so life.ike a way that they would instantly be recognized if met face to face giving a far more vivid impression to laymen than an unadorned coderaton of skuds. According to Dr. Victor Lebzelter, museum anthropologist who devised the process, two features clearly define the physiognomy of every race-the bony skull itself, and the muscular and fleshy tissues that overlie it. Post-mortem bead measurements, among modern races most nearly related. enable him to estimate the original thickness of flesh at various points on sacreat human skulls in the museum's prized collection. Plastic buttoos of corresponding thickness are fastened to reference points on the skull, and the contours filled in. The plaster cast from the resulting model is said to be an accurate representation. Only the eyends, the lips and tip of the nose are left to the imagination.

# This weird looking weapon is a new gun that shoots bails of fire The funnal protects the user from mayory

#### **GUN SHOOTS FIREBALLS**

A gust that shoots balls of fire is a western inventors contribution to warfare, representing an attempt to modernize the Greek fire of the ancients. The new gup would be used to project incendiary pelicis of a powder composition at low-flying aircraft. The odd weapon has a capacity of eight shots before reloading.

#### BOILER MAKES STEAM BY ELECTRICITY

REVERSING the customary practice of using steam power to generate electricity, a Montreal, Canada, milk and ice cream plant uses electricity to make steam, Its four coalfired boilers, of 150-horsepower capacity each, have just been replaced by a new electric boiler that operates without soot or smoke Favorable electrical rates are reported to make electricity a cheaper "fuel" than coal. Water is beated by its own resistance to carrent flowing directly through it, between submerged cast-iron electrodes. Altering the water level in the boiler controls the rate of steam production, by varying the depth to which the electrodes are submerged and, beare, the amount of current flowing An interesting supplementary method of control is by injecting small quantities of salt into the water to lower its electrical resistance. A central switchboard regulates the process.



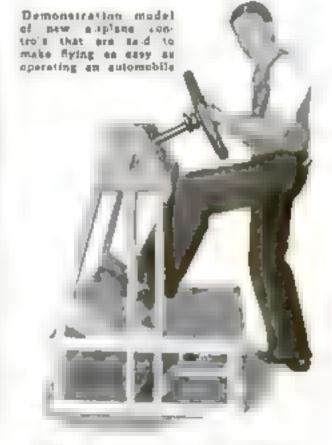
Control board that operates an odd booser for generating ateam from water by its constance to an electric current sont through it

#### SKIN SHEEP BY COMPRESSED AIR



Skiening sheep on a Wyoming reach by means of compressed sit

SKINNING a sheep with the aid of compressed air is an innovation that has been tried out successfully in Wyoming The air injected beneviil the hoof of the animal under a pressure of from forty to lifty pounds per square inch, inflates the skin and separates it so effectively from the carcass that an expert skinner can remove it in forty to fifty seconds. Thus the hades are sped on the way to the factories where they are made into sheepskin coats and other articles of apparel. The photograph at the left shows the new process in actual use by skinners.



#### NEW CONTROLS DRIVE PLANE LIKE AUTOMOBILE

Amplane controls of a new type, invented by a former Army pilot, are designed to make flying a plane as easy as driving a car. The conventional control stick, and rudder bar or stirrups, are climmated. The ship is nosed up or down by depressing the toe or heel, respectively, of a foot pedal. To make a turn, the pilot simply spins a combination steering wheel in the desired direction. The wheel is composed of two split sections mounted one below the other. One operates the rudder, for directional control, the other, the ailerons governing lateral inclination or "banking,"

#### OUTBOARD RACERS BORROW A SPEEDWAY TRICK

With the increasing popularity of long distance races for outboard speedboots drivers are utilizing an old trick of the automobile racing game in getting from their "pit" workers such information as the number of laps they have made, their average speed, how much of

a lead they have over their competitors and other useful data to the driver and his mechanic. A large piece of plywood is used by one of the shore men to flash data to the boat as it speeds post the "pit" where the mechanics stay.



## Auto Provides Club Car For Highways

Below, exterior of the new beelle shape have much a assert from he coar quarter. Photo at right above the ones a lone of a long of which abords its passengers all the cotalorts of a coay drawing-room.





Forward" and "aft" are terms used by the maker in describing cruiserisks accommodations of a beetle-shaped automolate just introduced to American motor ists. Easy chairs within the roomy body may be arranged about a folding table, while a wide fear seal, equally movable, may be awang around lengthwise of the car to serve as a lounge. An extremely low center of gravity insures freedom

from swaying. According to William B Stout, noted airplane builder and designer of the new car, the unconventional machine is shaped with the primary purpose of making steering easier

#### BUILDS WORLD'S BIGGEST FIDDLE



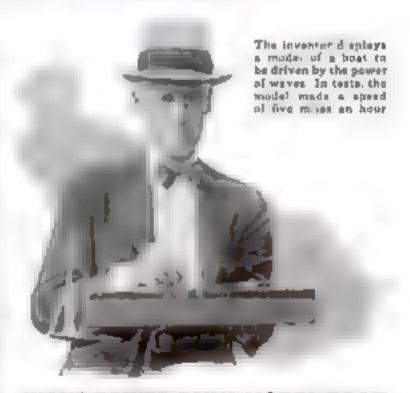
Pourteen-look base vice being played by Its builder with the aid of a platform

Along with several other original and cursous musical instruments, an elderly violin maker of Iroma, N has built what he believes to be the largest bass vsol in the world. It is fourteen feet tall and the sound box alone measures seven feet in height The bridge is so far above the ground that the giant fiddle can be played only with the aid of a platform. The neck, bridge, and inilpiece are detachable to make it more easily portable. Of the several instruments invented by the builder of the huge bass viol, the strangest is a "horn of plenty" harp. with forty-three strings and a sound box like the horn of a public address system. A hybrid barp and 'cello known as a lute-harp, a dwarf 'cello, a smaller lute-harp, and a queer violinlike instrument with three necks and harp strengs, complete has collection. A landscape gardener by profession, he makes violins in his spare time

#### MAGNIFIER HAS BUILT-IN LIGHT

A MANDY magnifier with a built-in electric lamp has just been placed on the market by a Texas manufacturer. It is designed especially for the use of stamp and com collectors. natural history students, and others who habitually examine small apecimens. The lens is pre-set at the proper focus and is enclosed in its acaminum housing three inches bigh. Adthat is necessary is to connect the device to the nearest electric outlet and place the specimen beneath it. The interior of the reflector is finished with a dead mat surface to provide diffused illumination throughout the field of vision



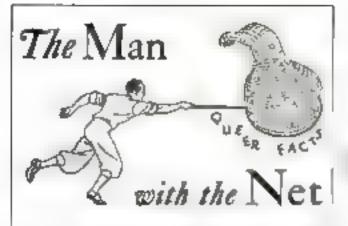


#### WAVE POWER RUNS MODEL BOAT

Using the power of the waves to drive a statuonary power plant has been proposed before, but it remained for a Long Beach. Cast inventor to design a wave-operated mechanism to propel a boat. Models used to try out the odd principle are reported to have shown surprising speed in tests, one miniature eighteen-inch craft attaining a pace of five miles an bour. Similar gear, the faventor suggests, could be appared to any full-sized craft, and could be attached or removed at will. The equipment comprises three fins attached to flexible joints, which are set vibrating by the slightest motion of the water, and are interconnected in such a way that they transform the vertical movement of the waves into impulses that drive the boat forward,



Close-up of model, showing his that gather energy from waves



PARADOXICAL FROGS of South America are bigger when they are young than when they are full-grown,

FIFTY YEARS AGO, only ten electrical companies existed in the whole world.

THREE-DIMENSIONAL ILLUSTRATIONS form a feature of a new toxibook on physics. The pictures, in pairs, are viewed through a storenscope which accompanies the volume.



STARFISH MUSCLES can exert a steady pull for forty-right hours.

TWO LETTERS, pasted in New York at the close of a business day, will both active at their destinations at the same time if one goes by air mail to Omaka, Neb., the other by ordinary delivery actus, the street.

ONLY MEN of fifty-five or older can work in one department of a Detroit automabile factory. Their jobs require patience and experience.



THE NAME of Stradivorum has been forged more than any other in history. For more than two centuries imitations of his famous violins have appeared in all parts of the world.

SEA WORMS have 20,000 burbed bristles which they shoot like process at their enemies.

WHEN ten was sweetened with molastes, it sometimes turned to luk. The new which entered the syrup from bettles in which it was boiled combined with tunnin in the ten and produced black from tanuate, now employed as an iron luk.

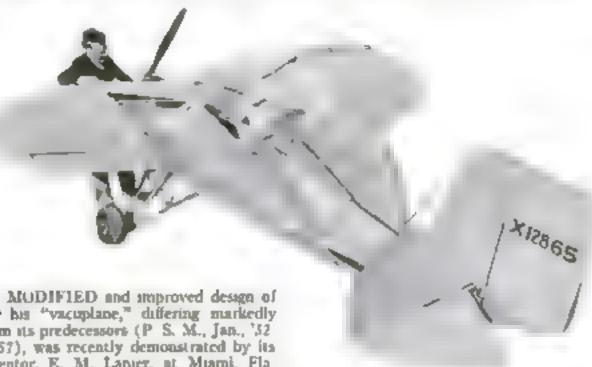


GIRAFFES were nearly wiped out by World War bullets. Their long necks broke telegraph wires strung on poles by colonial troops in Africa and orders to shoot the animals on right resulted in the destruction of large numbers. Since the war, special regulations have protected them and they are rapidly multiplying again.

RED AUTOMOS LES ere prohibited by less in Minneapolis, Minn.



#### INVENTOR TESTS NEW SUCTION PLANE

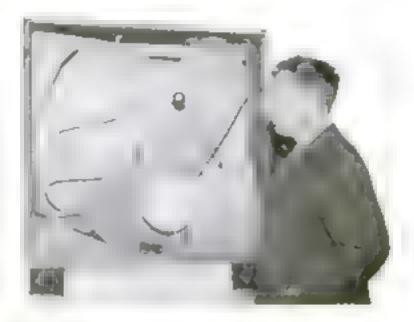


A MODIFIED and improved design of his "vacuplane," differing markedly from its predecessors (P.S. M., Jan., '52 p. 57), was recently demonstrated by its inventor, E. M. Lanier, at Miami, Fla. This odd craft is provided with suction cells on its upper surface, which are said to increase the lift and reduce the required wing area. The new model weighs 560 pounds, is only sixteen feet long, and

is reported to have a speed of ninety-six macs an hour. The plane is shown above with its inventor, at left, comparing notes with his pilot on the machine's performance.

#### MOVING GADGETS MAKE NEW "ART"

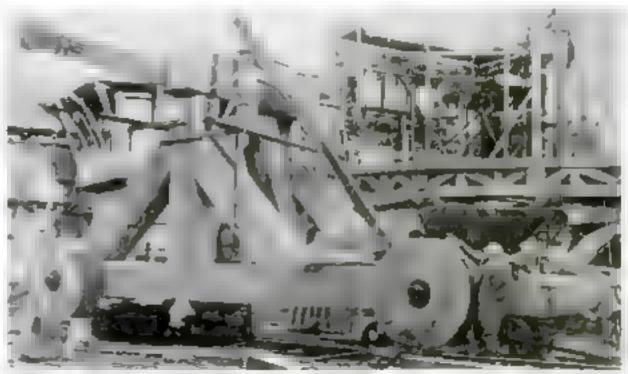
Moron-patrick art is the creation of Alexander Calder, sculptor, who recently exhibited some of his remarkable designs at the University of Chicago. His "pactures" consist of abstract designs of disks, balls, rods, and wires that are simultaneously set in motion by pulleys and springs, of which an example that be calls "Black Frame" is illustrated at right. According to Calder the rocking and bouncing objects present a new medium of artistic expression



#### REPRODUCE ANCIENT SIEGE ENGINE

Watertine eleven tons, a guant catapult built in Hollywood for use as a motion picture depicting the Crusades is claimed to be the largest single movie "prop" in the world. Its size may be appreciated by comparison with the men standing be-

side it in the picture below. The sham war engine closely resembles those actuarly used in ancient sieges, to burl rocks weighing up to 1,800 pounds. The crude projectiles were not directed against the defenders but at their fortifications.



Pull-alse reproduction of an ancient catapult made for use to a motion porture of the Critisides



#### SHUTTERS SHIELD PLANE ENGINE FROM COLD AIR

To satisfue its engine from fright winds, an airplane destined to ply the world's most northerly air route has been equipped with a new kind of air abutter. Control-the from the cockpit, the device cuts off air both from the cyanders and the crankcase of the engine. Previous types of shutters have protected the grankcase none. With the shutters closed, the plane is said to gain five miles an hour in speed. The plane is also provided with rubber muts on the sides of the fuselage to protect it from the thrown by the propellers. It has just been delivered for use in Alaska.

#### CARVES STATUES OF ICE

With his studio kept at a temperature of eighteen degree F., a Memphia, Teon sculptor carves 400-pound cakes of ice into statues for advertising purposes.

#### SYNTHETIC ECHOES MADE FOR TALKIES

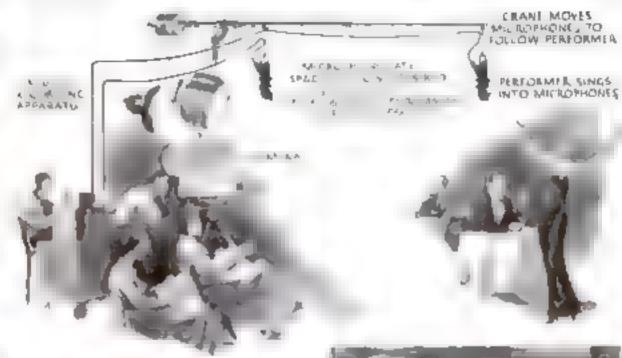


Diagram shows how twin microphones get an artificial acho for realism in tacking

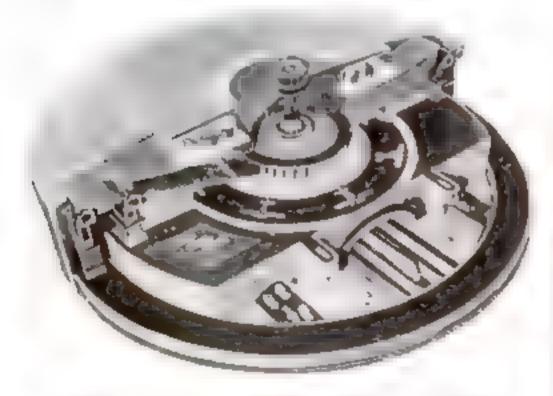
BY HARNESSING echoes, sound men are adding new realism to the talkies Recent scientific discoveries have shown them how to deaden unwanted reverberations or create artificial ones at will. A propeer in this field, Prof. Vern O. Knodsen of the University of California, built a test chamber in which a louspeaker produced an actificial shrick, and a spinning paddle kept the air storred while the echoes died down. By measuring the time this took, he compared the sound-absorbine qualities of materials ranging from burlan-covered board to a strange mineral substance that absorbs sound like a 8(3r) (BMM)

Another problem long baffed sound men. When an actor walked away from the carnera, his voice continued to sound near. The fact is that we judge the distance of a sound we hear not only by its loudness, but also by echoes that bounce



Testing a sample of building material for sound absorption in a special test chember

on k from walls and furniture in a small or large room. To supply reads a controllable echoes, movie technicians arranged twin incrophones as shown in the diagram. The nearest one picks up the voice first, and the other obtains an apparent "echo," the spacing being chosen to produce any deared time lag.



#### MODEL SHOWS SUBTERRANEAN AIRPORT

SUBTERRANEAN airports are foreseen for use in peace and war by Dr. William W. Christmas, pioneer aircraft designer, who recently exhibited a model of such an air terminal. In his plan, incoming planes land upon the bowed roof of the airport,

and travel down ramps to lower levels to discharge passengers and cargo. The structure also serves as a terminal for pneumatic mail tubes.

#### TUBES REPLACE STRINGS IN PIANO

A PIANO that never needs tuning has been constructed by a Los Angeles, Cahil., inventor. Its chamelike notes are sounded upon forty-nine tubes of metal alloy, which replace the usual steel strings. A standard keyboard is used to play the odd instrument, which has a compass of four octaves. The inventor has made instruments fifty years



Hovel plane in which tubes of metal alloy replace usual strings

#### ADJUSTABLE HOOK HOLDS DOOR SHUT

An adjustance hook that may be lengthened or shortened as desired is a newly invented household convenience. The adjustment, made by turning a milled collar, aids in fastening a warped door or screen. It also provides a means of tightening the book to serve as a lock, closing the door so tightly as to prevent a wouldbe intruder from prying the crack of the door open in an attempt to gun entrance.



Arraw paints out miled coller that regulates length of book



#### NEW RACING CAR RESEMBLES WHALE

For Sir Malcolm Campbell's latest assault upon the world's automobile speed record, British engineers turned out a car that has no counterpart. A long slot at the whatelike spout of the monster admits air to cool the huge

engines. Guiding the Juggernaut from a sunken cockpit the driver is shie ded from the terrific air blast that occurs at speeds of more than four miles a minute. The great bulk of the car is occupied by its powerful engines.

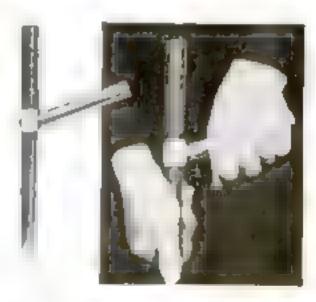
#### BURSTING BOMBS SMOTHER FIRE

Romation foreshadowed by recent successful experiments at Rome, Italy. The non-fire bombs tried out for the first time in these tests go into action at the ends of long poies. Exploding, they scatter a smothering blanket of chemicals on the

ture above which was made as the bombs were being demonstrated in use against an artificial blaze. The picture at upper right gives a close-up view of one of the bombs held on a fireman's pole. It suggests an oversuce rifle arenade

#### PRACTICE GRIP FOR GOLF CLUB IMPROVES PUTTING

LEARNING the correct golf stroke in putting is said to be made easy by practice with a diminutive attachment for the clob, comprising a revolving grip and a clamp for attachment. When the grip is held against the leg as shown below, and the other hand is used to swing the club, it naturally follows the motion of the "pendulum stroke" that skill ful golfers use, and increases accuracy of shots.



#### MAGNET IS USED LIKE A BROOM

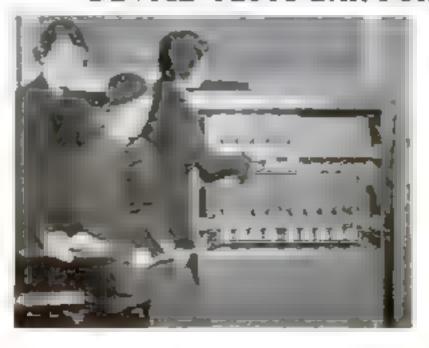
A "MAGIC MOR" is the answer of General Electric engineers to the problem of getting rid of ball bearings spaled on their factory floor. The magic is provided by a sliding elec-



Pictors shows by I begrings to electromagnetic map

tromagnet on the handle. Pushing the magnet down automatically energizes it for picking up the bearings. When the magnet is raised the power is cut off, and the metal balls drop into a receptacle for disposal.

#### DEVICE TESTS EAR FOR MUSIC



WHETHER prospective music students have sufficient inhorn taient to justily their atudies is revealed by a nove testing device developed at Northwestern University. It copsists of fourteen steel tuning bars, each differing in puch from the next by only a quarter of a tone. If a subject can distinguish one from the next when they are struck, he is qualified to play a stringed instrument demanding a sense of pitch. If not be must stick to piano.

#### LET ME HELP YOU PLAN

# Your Camping Trip

AKE enough bedding for comfort, up insect-proof tent, only enough food to last. Add fishing tackle, matches in a waterproof box a compass, a little concentrated food for emergencies, a strong knife, and a gun. Mux it with nature for two weeks. There you have the formula for a successful and comfortable camping trip, no matter whether in the woods of Maine, the Oxarks of M stouri, or among the lakes and atreams of the California mountains

During the last ten years, I have packed

many parties into the high Sierranof California. With out exception, those who had the lore-sight to carry enough conveniences to shorten the duly camp routine and give them maximum hours on trails and takes. There a no need for those accustomed to easy living to punish themselves by a too rigorous routine in the open.

If you plan to pack in to some spot inaccessible by automobile, put up all your groceries in small hotes such as canned mak cartons. Try to have all of about equal weight. Each pack animal will carry from 150 to 200 pounds, depending upon altitude and the distance to be packed; and the load must balance. Also, equalnted loads in small packages make it possible for a borse to carry forty to fifty pounds more, thus saving time and expense. Later, the boxes will prove usefol as shelves for toilet accessones in lents and as storage space for food.

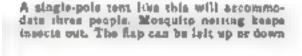


The nother enhibits a perk horse properly leaded with tents bedding, and givening

Since there are limits to the load you can carry conveniently—and this is true whether you use pack horses or your car—take no more than is necessary Foodstuffs are particularly heavy

Sit down with pad and pencil and plan each meal before you start on your trip. You will find you require less than you would buy if you guessed at the animan s.

Unless you take along a trailer, sure cases have no place an camping trips. It is better to pack all small objects, including blankets, pillows and boots, in duffel bags, fourteen inches in dismeter and thurty-six inches deep, for convenience.



Soft objects, such as bedding, may go in one, while botties, pans, and the hard items go in the other. Separate metal and glass objects by layers of cloth or a pair of socks, not only to distribute the weight but also to prevent rattling. More than one pack borse has become frightened and bolted down a mountain trail because he heard a wash hasin cattling against a flash light. Place clothing and accessories needed first at the top, particularly if you plan to stop on the way to your camp spot.

Do not pack in more than ten miles unless you are accustomed to riding, and plan to reach your camping apot by noon. This gives you time to pitch your tent, make cooking arrangements, lay out a cupboard, and be ready for hiking hunting, or fishing when the sun breaks through the trees early next morning. If possible, select a spot which is shady during the day but receives the morning sun.

Hy giving your attention to a few details during your first day in camp, you will minimise your labors for the remaining weeks. Tents, stoves, and fond should be placed in protected areas and fastened firmly to the earth or trees as protection against wind, tain, and insects

Be sure to have plenty of ventilation in your tent. As a safeguard against colds it is better to have a floor. Most modern tents come with a canvas flooring of the same color and material as the roof. A mosquito-netting flap and a window of the same material will permit you to sleep in the open air and yet protect you from the annoyance of insects. In cold or wind, close the flap but leave the window slightly open. A mised section of canvas at the base of the entrance not only helps keep the floor dry, but also prevents the en-

HANGING CUPBOARD FOR OPEN FOOD

Open food should be kept in a box surpended from a rope. A rubber poncho maken it weatherproof and can be used as a cape, so seen at the right

went 155



A veteran packer of the Sierrus tells you how to make your vacation in the outdoors more comfortable and pleasant

By Billy Mowlds

This little stove folds into a flat package, may be carried in the saddlebags, and provides a fire as bot as any range. It can be folded in a few seconds and made ready for another journey The second method consists in converting a twopound coulee can apro a grove which provides a fire but enough to buil coffee and heat beans. Punch a few holes near the bottom, fall it half full of sand

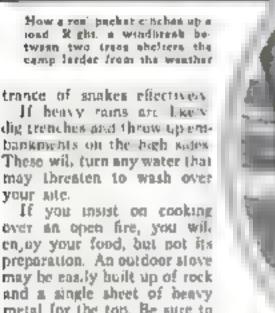
few chips, and have a roaming fire in a minute.

or loose dirt, place it on three or four rocks, and cover with any available open metal, such as screen or two or three metal rods. Then pour a cupful of gasoline over the dirt, and touch a match to it. If stirred occasionally, the gasoline will continue to flame until its purpose has been

In arranging your larder, remember that insects prefer sweets; chipmunks and squirrels attack anything they can reach; bears have a yen for sweets and meats and, in some chimates, wet foods left open will spoil in a few days. Canned goods, foods an jura having tops, and sundries, may be left in

the open. I have found it a good practice to build two shelves between adjacent trees, tying a piece of canvas at the back to serve as a wind break This provides room for three tient of supplier. Flour commeal bacon, eggs, and opened packages should be awung in a bux from a rope and covered by a tarpublin or rubberized cloth. Were the lower end to n teat peg driven late the earth immediately below. This arrangement is proof against both storms and small an .

Even if you pack into the woods or mountains away from the stores, you may enjoy fresh eggs and hutter no



your aite. If you insist on cooking over an open fire, you will en, sy your food, but not its preparation. An outdoor slove may be easily built up of rock and a single sheet of heavy metal for the top. Be sure to face any open stove toward the preveiling wind in order to take advantage of natural draft

conditions. It is essential to carry along a single length of stove pipe to stimulate the draft and carry smoke

away from the cook

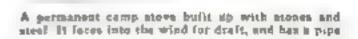
I prefer a small gasoline stove. You can transport this type easily as a small pack. age, about four inches thick and eighteen inches square. It is supported by legs which fold into a very small cardboard box. Fuel is no problem, since one gallon of gasoline will cook meals for a week. A portable even, which folds into a package scarcely more than an inch thick, fits the top of this stove, making the baking of biscuit and cakes an easy matter.

Both the broiling and baking features may be combined in a single sheet-iron stove, fed with twigs and chips. This stove may be set up quickly by attaching the legs and fitting two lengths of stove pspeto the collar on top. It heats quickly. The advantage of this stove hes in the fact that it is light and may itself be packed with light utensils. Druft may be controlled by a damper which regulates heat in the oven. Cost is so small that the stove may be discarded at the end of the season.

Here are two methods I have found useful on the trail when traveling light. For frying a pan of fish and boiling coffee, I unfold the sheet-iron stove, cram a single newspaper page within it, poke in a



A HANDY CAMP STOVE A collapathie sheet tron stove an use for frying fish. It can be folded toto a package an inch thick and about night inches aquate



matter how long you remain in camp. Keep eggs in their cartons on the shelf. Place the butter in a pail and set it in the shallow water of a lake or stream, anchored or tied to a log for safety. The water should almost, but not quite, cover the paid In this way, you can keep the butter cool and solid.

Fruit should be eaten at every meal and one large can of vegetables or fruit serves four people. Breakfast of buckwheat cakes, pears, and coffee may be prepared in short order. For dinner, fish, lima beans, hiscuit, young bernes, and tea or coffee, may be cooked (Continued on page 107)

Ship Becomes Floating Brewery ALASKA WILL GET A REAL SCHOONER OF BEER

"ALLED the world's first floating brewery. the remodeled sailing vessel Alamna may set a new style in beer-making methods, Originally a Pacific lumber carrier, but forced off the sea by the competition of tramp steamers, the old craft has just been returned to service-this time as a complete manufacturing plant for beer, with a rapacity of 250 half-horrels

daily. A deck house was built forward to provide storage space for the raw materials and for the finished product, while faurteen fermenting vals of 100-barrel capacity each were installed in the hold. Present plans call for the beer ship to be towed along the Alaskan coast, making beer us it goes and setting it at every port. Smaller bosts will also distribute the product to fishing fleets and solated settlements. Since freight charges account for a large part of the cost of supplies purchased in Alaska, the innovation in beer making is expected to lower the price of the beverage materially and to make the enterprise probtable. If so



A view aboard the seagoing brewery showing s few of the drama in which bear is stored

the owners foresee a new use for bundreds of old ships and barges now alle in American ports, which could be bought and trans formed into fleating breweries at a fraction of the cost of erecting plantaashore Thissaying would be in addition to the economies effected in delivering the product to distributors and consumers.



The old enting vessel Alumna formerly a lumber corner. which will make beer and deliver it directly to its market



#### PHOTOGRAPHS REPRODUCED ON TILE

TRANSFERRING photographic decorations to clay tile is said to be made commercally practical through a method recently developed. In the new process, the photograph is reproduced in large and small dous on a plate resembung a half-tune engraving, except that it is etched more

deeply. The image is then transferred to a flat tile with the aid of an offset flexible roller, in a tacky, combustible material that serves as an adbesive for pigment dusted upon it with a powder puff. When the tile is placed to the furnace for firing the color is burned into the clay

#### MIRROR ON TRAP MAKES MICE RACE FOR BAIT

To aver mice to their destruction, an Illinois inventor is introducing a small convex mirror to be attached to a tran, or set near-by. A mouse that sees its reflection in the wide-angle mirror, the inventor maintains, will imagine it has competition and will rush for the batt. Whether or not this is sound mouse psychology, traps equipped with the mirrors are and to have proved effective in disposing of rodents where they have been put into use over considerable periods of time

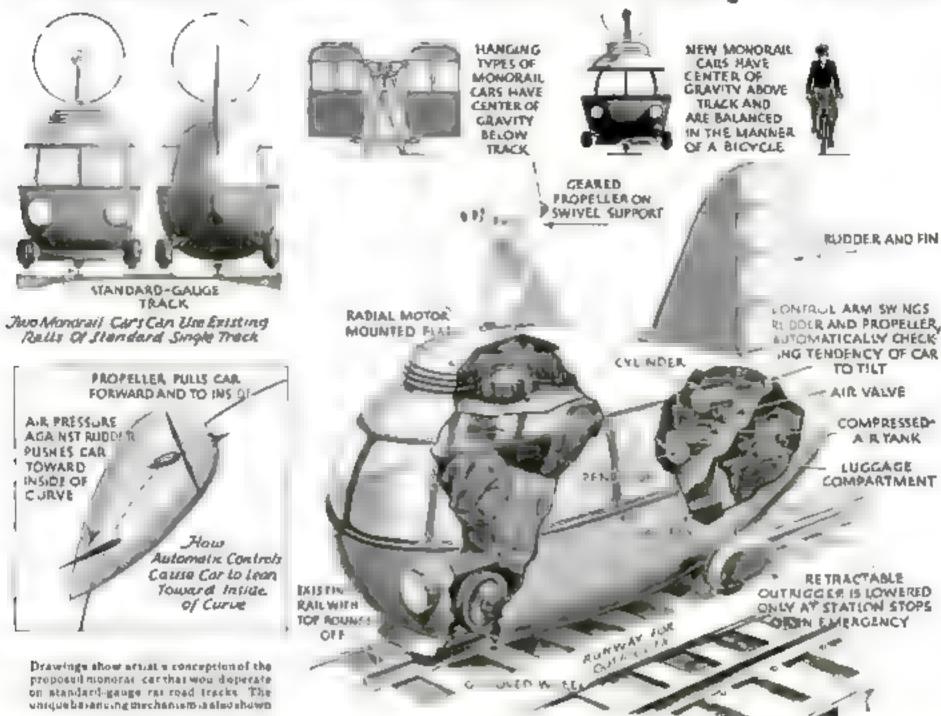


The mirror attached to this trap is supposed to trick gready mice into taking the best promptry



WITH its four wheels arranged in a dismond shaped pattern, a novel type of car proposed by Gabriel Voisin, French airplane builder, would have unusual maneuverability. The center wheels revolve idly upon a common axle. Single wheels at front and rear are used for steering and operate interconnectedly. The mutor, at the rear drives the handmost wheel. The model shown turns in very attle space.

## Monorail Car Rides Ordinary Tracks



MONORALL care capable of using the rate of existing transportation lines are proposed by a Cleveland Heights, Ohio, inventor. Thus he would obviate the expensive new construction called for in many monorall projects, and would provide a self-propelled vehicle that could be used by railroads either to replace or to supplement regular trains.

Since the new car is designed to ride who ly above the supporting rail, some means is required to prevent it from toppling. The ingenious mechanism worked

out by the inventor operates on the principle that a proycle rider uses to remain upright. The sur propeller that pulls the car is so mounted that it may be turned toward either side to counteract any tendency of the car to tilt, much as a man on a bicycle leans toward the inside of the curve it making a turn. An additional means of balancing is provided by an air sudder at the rear of the car. The two balancing devices are interconnected and operated automatically by it compressedair mechanism, in response to the action

of a sensitive pendulum that detects any deviation from an upright position. When the car stops at a station, outriggers on each side may be lowered to support the car on auxiliary wheels.

Even more similar in operation to a bicycle is a simpler form of the monoral car designed by the inventor for light traffic. Here the automatic balancing control is dispensed with and the driver balances the car with a hand lever resembing bicycle handlebars. In the smaller forms, either propeller or rudder may be omitted.

#### BOLT DRIVEN INTO STONE LIKE A NAIL

AN EXPANSION bolt just placed on the market can be driven like a name to brick, stone or



concrete. Made of spring steel, the bolt is shit for about half its length and the two sides forced apart to form a bulge. The end of the bolt is inserted in a hole drilled in the stone or concrete, and driven into piace with a hammer. The bulging sides exert a tremendous outward pressure, holding the bolt firmly in place. It is made with several types of head.

## TELESCOPE CAMERA MAKES LONG SHOTS

To get close-up pictures of mountain scenery from distant points of vantage, a photographer has constructed a camern resembling a telescope Sliding cylindrical sections give it enough extension to accommodate a lens of four-foot focal length, which makes a remote peak seem only a few steps away. To hold the instrument steady in the wind, its owner has supplemented its standard triped with a two-legged brace attached to the rear of the platform.



Long-range camera mounted on its novel wind-resetting bate

# Laboratory of Warfare

KEEPS OUR

ARMY UP-TO-DATE



Soldier-Scientists Forecast the Doughboy of the Future by Tests of Everything He Will Use, from His Rifle to the Shirt on His Back

Co' R H Ko to w

#### By THOMAS M. JOHNSON

solvier with a garden hose was sprinking water on a blanker spread upon the ground. Ho was trying to roak it through and through. Presently, he looked upon the advantage of aded that its had had become gray, and its red, rusty sa mon. With a pocketknife, the solvier cut a generous strap of coth from each flag. Then he entered a low, wooden huilding

Open-mouthed, I stated after him

Over the door, I saw a sign "Department of Experiment I knocked, opened the door, and—instructively—ducked "Tack-tack-tack-tack."

The air within was filled with the rancous yammens machine gun. There was a machine gun in the room, too—but it was not firing. The deafening noise came from the hotaliks mouth of a contrivance resembling a wooden coffee man ratchet and crank. An army officer was turning this crank enthusiastically

"In that an experiment?" I shouted.

The officer stopped turning the crank, and grained "Not any more," he reptied. "It works, as you can see and hear. Makes target practice more realistic, an practical. Sounds as if someone was shooting off thousand do lars' worth of ammunition. For instance, if we use the light ray."

Deftly he touched the squat, heavy Browning machine gun-From it poured a stream, not of flame and smoke and lead but of light—a slim, graceful ray, that shot across the room. filtered over a target, and then, under the officer's skillful guidance, came to rest on the bullseye.





The soldier on the left is wearing the new pack designed at Port Senning. It gives a better distribution of weight than the old pack, seen at right

"Pretty good practice," he explained, "and costs almost nothing. That's our job here—experimenting with new ideas, gadgets, inventions."

"Then you're the fellows I want to see," I said. "The fellows who try out new wrinkles for the Army-if a well-

conducted army ever has wrinkle

"Wed, seriously," said Col. R. H. Kedey, "the idea might shock an Inspector-General, but armies always have had new wrinkes. The chap who invented the stirrup, made possible the mounted knight who was king of the hattlefield for nearly a thousand years. Then another ingenious cuis devised the musket, which blew the knight and his armor onto the scrap-

heap. Time after time, such new wrinkles have surprised and defeated superior forces. and changed the course of history. Some times, the surprise has been on American armies. Our job here is to prevent that hap pening again, by keeping abreast of every development of science and invention that will and our national defense."

So, in time of peace, the Army is always Linkering, to keep its tools up-to-date, highlyefficient, and sufficient in quantity for small Army to learn the best ways of han-

ding them.

To carry out that policy, Uncle Sam started the Department of Experiment as a part of the Infantry School at Fort Benning, near Columbus, Ga., and just across the Unitahoochee River from Alabama, There, on a

reservation of 99,000 acres including every nort of countrymountains, huls, streams, marsh, sand—the Army is thinking up and trying out ways to do new things well, and old things better,

"Progress results from dissatisfaction," says Col. Kelley So they sprinkle water on blankets of an ingenious new weave, to see if they ready are water-

proof; they expose to all weathers flags both of standard woolen bunt ing, and of a new fabric of rectangutar weave-and find by test that

cotton cluth is better

The Department of Experiment is really a technical laboratory for test ing all projects considered of practical value to the Infantry, and for one nating new ones. At the time of my visit, there were thirty-five projects under way, including these

Investigation of an airplane moor ing kit for use as tent pins; protection of motor- and animal-drawn transagainst aircraft and ground attacks a cooling system for six-ton tanks puncture-proof inner tubes; neckties -black, light tan, and khaki; move ment by air of war-strength Infantry battalion, enhated men's experimentapacks; plans and specifications for a

1,000-inch smalt-arms range

In this laboratory, the scientists are the director, Colonel Kelley, and Captains Negrotto, Ross, Burnap and Rarey; there are also nine enlisted men, specialists in various kinds of army equipment. The laboratory has nearly 5,000 guinea pigs with which to experiment-two Infantry regiments, the 29th and 24th, Artitlery, tanks, and aviation. The doughboys of the 29th, especially, lead a varied and sometimes hettic existence, trying out other people's bright ideas. That new gas mask, for instance, with the exhister tucked inconspicuously at the back of the wearer's neck; just try making a loog like half smothered in the face piece, with the canister bumping and chafing the base of your

A new trick for using the I ght Browning of with light beam device for his letters target on his What the well dressed doughboy will Answer he was on to a see a man and applied esa produce a man centraberatera

> brain. "We'd rather get gassed" say the boys of the 29th.

> Eating waterless-cooker meals was not so bad. Neither was alceping on experimental pillows of chicken feathers instead of the tradit anal Army cofton. As for the natty new "clastique" breeches and snappy faced knee boots, as veteran Sergeant Burns remarked, "They make a goodfooking solder look better."

> "Benning," as the Army calls this odd experimental laboratory, is also a sort of military style show, with the doughboy demonstrating what the well-dressed solrijer of tomorrow will wear. On his bead he has neither the staff garrison cap nor the broad-brimmed Stetson of imported

rabbit fur, but a combination overseas cap and sou'wester, of domestic woul or cotton. It is light, and can be folded thin and flat to slip into a pocket. It looks jaunty, with brim turned up in back and down in front, to protect the eyes, Turn down the brim all around, and it shelters the ears and back of the neck. There may even be a new steel belinet, looking something like a brown derby, designed to prevent rocking on the head.

His shirt is no longer flannel, but serge, specially reinforced. His necktie may be blue for Infantry, red for Articlery, or yellow for Cavalry, instead of the traditional black. His breeches are "castique", a soft, phable corduray, grayish in color,



three-months test to be fauciesa under sun-

On his feet, the doughboy will wear knee-length luced boots of tan leather, or perhaps a new woven colton wrap putice, and a new all-purpose shoe, with believes tongue and rubber beels. These were evolved to replace the field shoe and the ganvas legging that let dirt work into the shoe tops. For active service, Technical Sergeant Leroy F Nicholson has proposed a loose jacket of branket cloth.

Designs for new packs have been submitted by Sergeant Nicholson and Sergeant Walter S. Hurley, to save the doughboy from the bent back millions of his comrades have suffered from the present sausage-shaped pack. Both new packs ride high on the shoulders with center of gravity close to the body, so the wearer can stand straight. Including tlothing, rifle, and pack, the soldier's load will be limited to a third of his weight, which is all be should carry Soon the fasthful guinea pigs of the 29th will be testing them out in hikes and maneuvres, day and night

If the new pack makes a hit, the doughboy will no longer tote the half of a canvas pup tent for use in bivouse. He will lay a sleeping bag upon the ground, crawlin and close the bag with a slide fastener If he uses blankets, they will be of a new waterproof weave, looser but warmer than the old Army blankets and designed by a Quartermaster Corps officer, Captain Harry Karsner. Even when he sleeps in a tent, the doughboy probably will not be "under canvas," but under twill. Tests show this material to be weatherproof, strong and sixty percent cheaper than canvas. One of the largest circus "big

tops" is twill Experimental cotton harness was very popular with the mules. They scented the steam lining, and ate it

The intentryman in the field will have better food than before, and without the renowned rolling kitchen. Marching along with him will come his chow, botting, frying or baking on a new gusosine-burning stove carried on a truck, wagon, or anything handy. On the back of the stove, perhaps will be a contrivance that cooks vegetables and meats in their own juices without water, by means of light-fitting heavy covers to keep in mossture. It has been proved unbreakable in tests.

The old-time water wagon, too, is on its way out of the Army. Uncle Sam's Gunga Dan will be a ten-gallon milk can in which water can be moved in any vehicle from (Continued on page 110)

### Tiny Power Plant Serves Nine Families



a year collected by the town.

water to the turbine and plants at



# Sleepwalking Locomotives

#### PROVIDE A REAL RAILROAD MYSTERY

LOCOMOTIVES RAGS AND SIGNS RUN N NO WILD LAST NIGHT STOP UN EXPLAINED RUNS WITHOUT ENGI-NEERS STOP DETAILS FOLLOW STOP PLEASE SEND IMMEDIATE ASSIS-TANCE

HANTASTIC tales abound in the lore of railroad men. Rich in romance are the yarns that are spun wherever old-imers gather to swap their experiences. But it would be hard to find one stranger than the true mystery story behind the telegram reproduced above—a story the events of which took place so recently that their details are fresh in the minds of witnesses.

The original of this startling telegram now reposes, along with hundreds of less exciting documents, in the files of one of America's great incomptive-building corporations. It was an urgent call for aid from a southeastern railroad, for strange things were happening in the line's yards at Atlanta. Go

Locomotives were walking in their sleep Smoking monsters, weighing hundreds of tons, were coursing along the tracks by night, with empty rabs and untended throttles. This was the astounding story with which a baffled milway superintendent met representatives of the locomotive

Locomotives that Locality and their sleep at Atlanta, Ga., not long ago, furnished one of the most amazing of true mystery stories in railroad history. The author of this article, a locomotive patent expert, tells how engineers acted as sleuths to solve this mystery.

firm, who answered his call for assistance Loder their close questioning, he supplied the details leading up to the mysterious happenings.

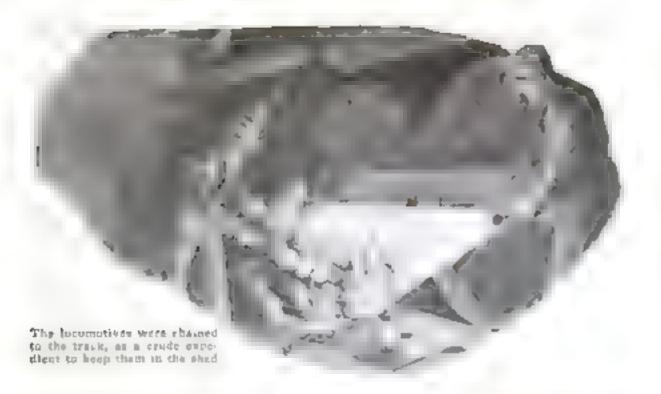
The two locomotives in question, R.3405 and S.3406, had been "put to bed" after finishing their ruos the evening before in accordance with the usual practice. In other words, they had been ruo into a shed, their throttles closed and locked,

By Edwin M. Martin their botters filled with water, and their tires banked. The engines had thereupon been left to remain "asleep" until their next scheduled runs the following day,

About four o'clock in the morning, men in the railroad yards saw Locomotive R3495 emerge from its shed and start, first slowly and then with increasing speed, down a track leading out of the yards. Thus, they knew, was not according to schedule. Their surprise gave way to amazement as the engine passed them and they saw that there was no one in the cab. The locomotive was walking in her sleep!

No wonder these sober rat road men could scarcely believe their eyes! Here was a phantom such as might have been drawn from the pages of fiction, suddenly materialized into the brusque reality of cold steel and whering drivers.

Out of the yards and down the track, uckely clear, sped the locomotive. Had this been fiction, perhaps the 140-ton Juggernaut would have wrecked a train carrying villamous rivals of its owner. This was not fict on, but what did happen was just as mexpicable. After several motes of somnambolisms travel the locomotive slowed down and stopped, with no more apparent reason than it had had at the start. Now it is to be noted that



locomotive \$3496 was looked upon as the sister engine to R3495. The two were of the same type and had been put in service at the same time, on similar schedules. \$3406 had been put away for the night on the same track, and almost at the same time, as its sleepwalking sister. Now it supplied the climax of the nocturnal drama.

Before the men in the yards had recovered from their surprise at the first runaway engine, \$3496 rolled out of the shed—without a man abourd—and disappeared down the track in apparent purnul. To complete the episode, it pulled up and stopped just behind the first locomotive, as if to keep some clandestine requesions out there in the darkness.

In short order, the runaway engines were manned and brought back safely into the yards. The mystery of their behavior, however, remained unexplained

SPECIAL engineers were assigned to stay in the cala of the engines at all hours and to report any unusual happenings. During the nights that followed, the cerie drama repeated itself regularly. A few hours after they had been "put to bed" both locomotives would mysteriously start to move; constant vigilance on the part of their keepers was required to atop them.

Every precaution, of course, was taken. The throttles were more securely locked at complete shut-off each night, without avail. Examination showed the throttle valves in perfect condition, and ruled out the simple explanation that leaky valves accounted for the engines' sleepwalking proclivities. Eventually, a crude but effect we exped int was adopted to keep the locomotives in their shed—they were chained to the tracks?

No railroad cares to have untended locomotives running loose on its tracks, nor does it want to have to keep them chained up to prevent it.

In its embarrassing predicament, the hae apparently was dealing with engines that had developed human powers of moving when they desired, and habits of takling secret excursions into the night

But enfloading is built upon science and hard facts; therefore mystery could be given no place in this enterprise. With only such romance as is derived from equations and formulas, in their plain small office, the locomotive builders set to work with their saide rules and charts. And in their usual matter-of-fact way, after many bours of careful calculation, they at last announced that the problem was solved. As with other apparent mysteries, it all seemed simple enough when the solution was known; yet arriving at this solution involved at elaborate piece of scientific defective work.

To understand just what happened, we must look inside one of the locomotives because the two were virtually identical in design and use, a description of one applies equally to the other

In general, R 1495 conforms to the usual design of steam locomotives, as shown in the accompanying diagram. Steam is generated by fire tubes passing through the boiler, and is collected in a steam dome. Here a throttle valve, when opened, admits the steam to a conduit known as a "dry pipe," and through this pipe the steam flows to the cylinders and drives the locomotive. Any passage of steam through the throttle valve, whether from leakage, incomplete closing of the valve, or any other cause, would cause the locomotive to move forward without human control.

Hence, interest was centered upon the operation of the R3495's throttle. They checked each of its interconnected parts, shown in the diagram: the throttle lever in the cab; a rapid reach rod, extending forward; a bell-crank lever, pivoted to the "dry pipe," serving to transmit the motion of the reach rod to a pair of vertical rods; and finally, the throttle valve itself open when ruised and closed when lowered. All were found in perfect order

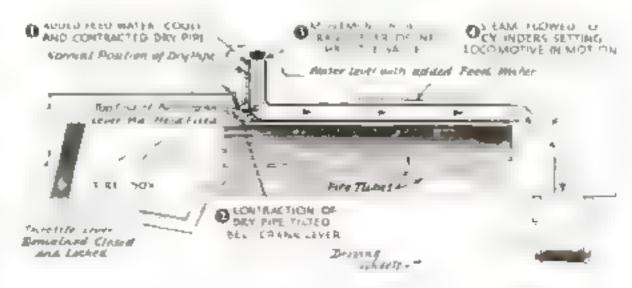
Investigation showed that the water level in the boiler was normally at the bottom of the dry pipe. When the engine was called in, however, more water was customarily added to the boiler, rusing the level above the dry pipe. Here was the first agnificant clue. The normal running temperature within the holler was oss degrees F., and, therefore, this was also the normal temperature of the dry pipe. The feed water added when the engine was run into the shed was at 109 degrees F., or nearly 200 degrees cooler. Taking into account these facts and the length of the dry pipe, which was eightern feet and two inches, the engineers began calculations that led to the following some tion of the enigma

Wiffen the locomotive was housed for the night, the addition of the cooler water had no immediate effect, but in due time it lowered the temperature of the dry pipe. In accordance with a well-known law of physics, the pipe contracted as it cooled, and the drop in temperature of nearly 200 degrees caused a total contraction of considerably more than an inch. The effect was to draw the rear end of the pipe forward by more than one inch.

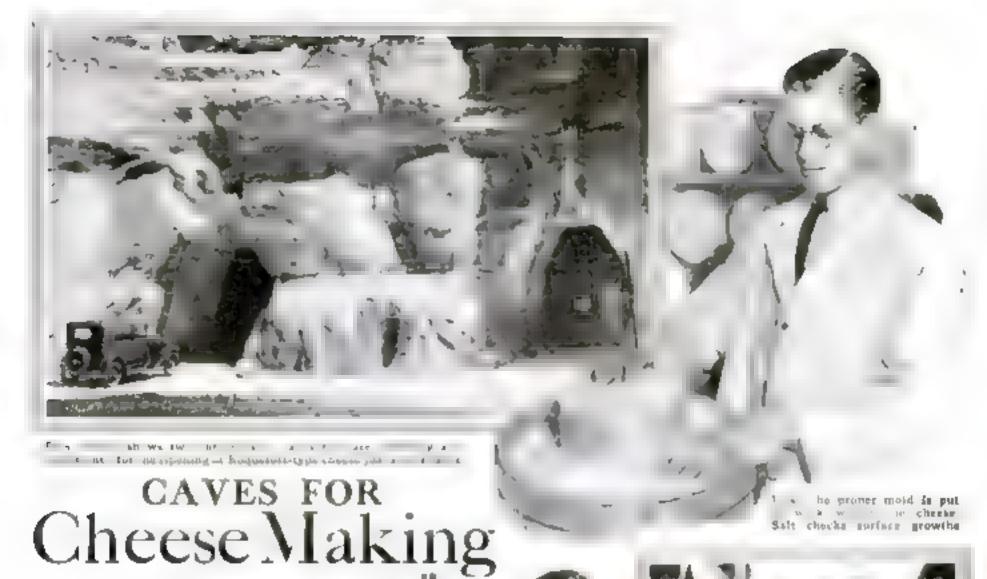
Because the bell-crank lever operating the throttle valve was mounted on this pipe, it also was drawn forward. However, the top of the bed-crank lever could not move, because it was attached to the locked throttle lever. Hence the whole bell-crank lever was tilted, the throttle valve was raised, steam flowed into the cylinders, and the engine began moving.

On the first night of its sleepwarking R3495 had been supplied with more feed water than S3496. This explained why it started before the other on its mystery trip, its dry pipe contracted more rapidly than that of its sister engine. Both locomatives stopped when they had used up there at very small amount of steam that is carried in the boder under such conditions. Luckily the second engine haited before it could collide with the one that preceded it on the same track, or the story of the runaway locomotives might have had a more serious conclusion that it did.

Once the mystery was solved, it was a simple matter to provide a new support for the bell-crank lever, independent of the dry pipe and on a part of the boiler in which it would not be affected by expansion or contraction. And the rai road men breathed rights of relief when they knew that the skeepwalking prants of the sister locomotives were stopped.



Drawing shows the solution found by engineers for the mystery of the sleepwalking angiors



DISCOVERED IN AMERICA

ECALNE an observant scientist not ced beavy-rust on a lantern, dur ing a chance visit to a musbroomgrower's cave, American durymen may now produce a cheese that is said to vic in flavor with the prized Roquefort of France, The te Itale rust convinced Prof. W. B. Combs, of the University of Minnesota, that sandstone caverns of the Mississippi River bluffs matched European caves in providing just the right temperature and humidity for ripening this delicacy. As a trial, he had 10,000 pounds of Roquefort-type cheese prepared from cow's milk and repend in one of the caves The experiment, it has just been announced, has been completely successful yielding a product of fine flavor and con

sequently. Prof. Comba concludes that Minnesota alone can produce as much Roquefort-type cheese yearly as the whole country now imports.

What makes this project commercially practical is simply that the catural caves remove need for expensive air-conditioning, for no mystery of climate or geography determines what cheese can be made Nature need not even be depended on to provide the particular bacters and moids that he p develop the flavors of various types, because government agencies now supply pure curtures of the organisms. Only stight variations in the fungamental processes



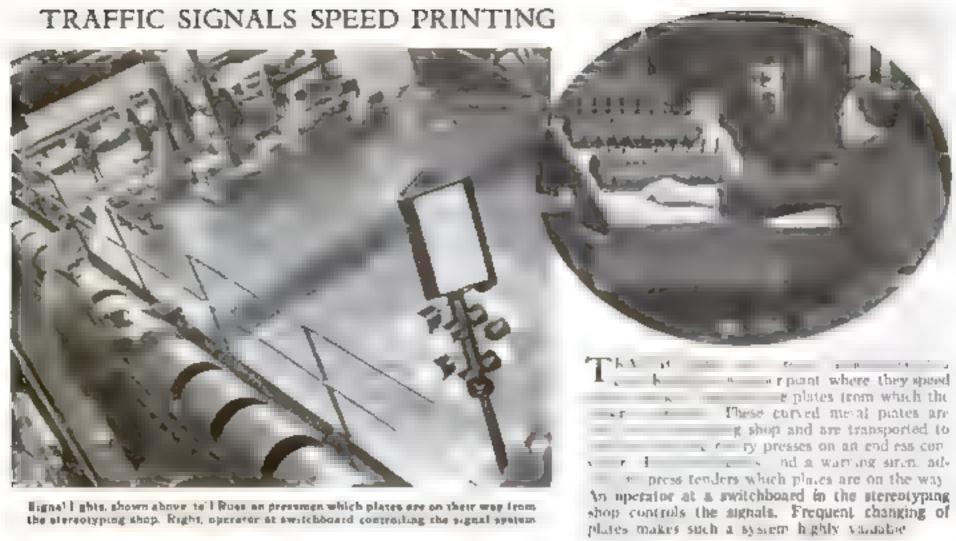


of cheese-making—curiling the milk, cooking, solting, and shaping the curd, and ripening the new or "green" cheese—are needed to produce all the 400 or more named varieties of cheese

Common American cheese owes fix mild flavor to being placed in cold storage almost as soon as made Swiss cheese, in contrast, is ripened for weeks or months in a worm cellar to favor development of gasforming pacteria. Camembert, Stilton, and Roquefort are among the varieties that derive their paquant flavor from molds, the greenish-blue mold of Requefort is cultivated on moist bread, dried, and sprinkled with a sait shaker between layers of the new cheese as it is shaped in hoops. An expert can tell from the sound made when a Noves cheese is tapped, whether it is yet ma safe



Testing for maturity, in the cave. The flavor improves as the mold socreases





#### BURGLAR ALARM GUARDS LOAD ON MOTOR TRUCK

An automatic burglas slarm for motor trucks, recently placed on the market turns on an ear-splitting sires and locks the ignition in "off" position if the door of the driver's cab is left open beyond a predetermined time. Locked at the dispatching point, the alarm can be unlocked to permit unloading, only by the agent at the receiving end. The driver merely in serts a key in a dashboard control boarshown above, and manipulates certain buttons on entering and leaving the cab. If he varies the procedure in any way the alarm sounds a warning unmediately.

#### FLASHING NEON LAMP TESTS IGNITION

A NEW instrument, shown at right for checking the tuning of a car's ignition system, contains a neon lamp that flashes simultaneously with the spark in the cylinder. If the timing is accurate, a mark on the flywheel appears to stand still. If not, its position with reference to a second mark on the flywheel housing, shows if the firing is too early or too late. By special procedures, it is also possible to synchronise double points.

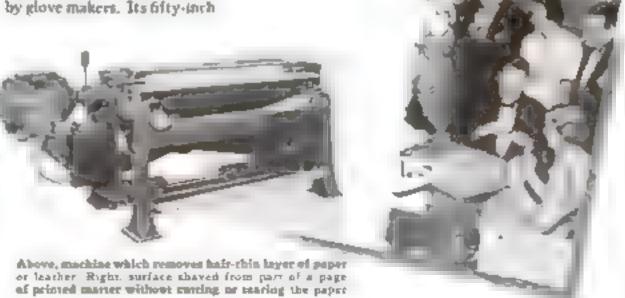


#### MACHINE SHAVES PRINT FROM PAGE

A gainness machine so precise in its operation that it can shave the print from a piece of newspaper or a magnaine page, without cutting through at tearing the paper, has just been introduced to industry. Its makers estimate that this mechanical marvel can be adjusted, if desired, to take

off a sice only one thousandth of an inch thick, or thinner than a human hair. The new machine, run by a small electric motor is intended for use by glove makers. Its fifty-inch

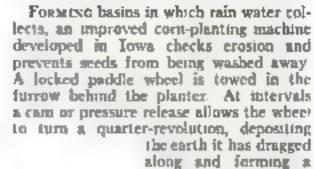
grinding roll will be used for shaving tanned hides to the exact thicknesses required for the delicate materials of which women agloves are made. With this equipment, many hides that would otherwise be made up into above or men's gloves can be worked to the thin finish.



#### HARNESS HOLDS CROOKS

To prevent prisoners from escaping while being transferred from jail to court, an inventive deputy sheriff of Portland. Me., has devised a "bandouff harness." Wristlets cunfining the prisoner's arms are attached to a belt, restricting his motions so that he cannot balance himself to run although he can walk without difficulty. The picture shows it being tested.

#### PLANTER PREVENTS WASHING OF SEEDS



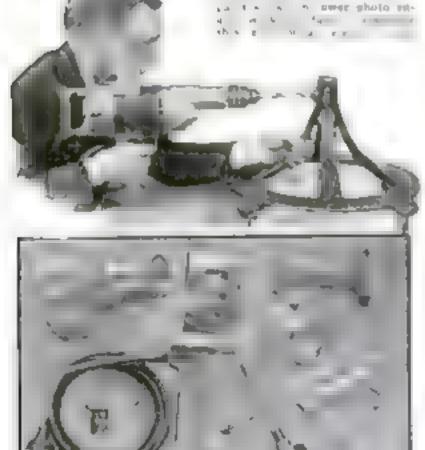
along and forming a miniature dant across the fresh furrow.



Paddles attached to rear of planter gouge out troughs which colob and hold rain. On left a field after planting with the novel apparatus

#### KIT MAKES DRILL OF OLD GENERATOR

gaperator and the



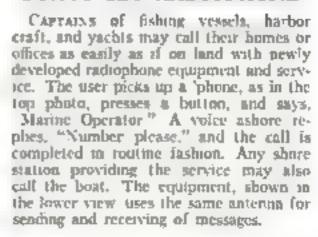
#### ONE MOTION OPENS SUIT CASE

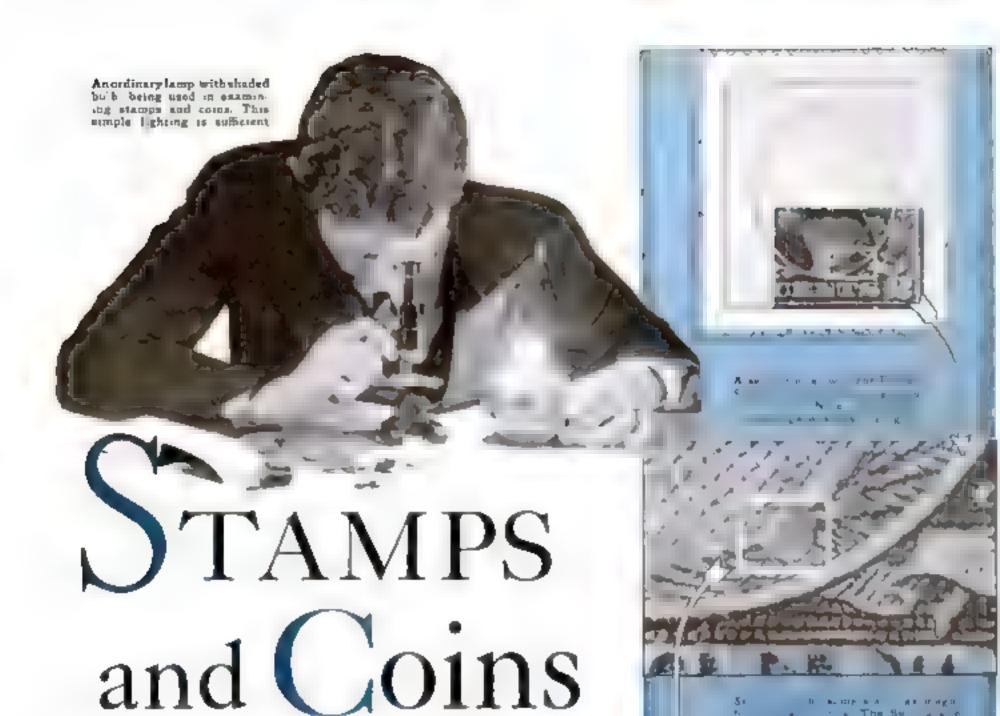
LATCHES at the center and at both ends of a new traveling bag, shown at right are released simultaneously by pressure on a single button at the center. The button is commend with a five-tumbler lock of cast automount, operated by the owner's automobile door key. This removes the need of carrying two keys, and simplifies the task of locking the bag to protect its contents against the activities of the petty thief. Its chief virtue, however, is the ease with which it is opened. All tussling with locks and latches is eliminated.

Wire the aid of a kit just placed on the market, an asnateur mechanic can build his own electric drill using an old automobile generator of the Ford Model T type for power A statable generator, which the maker declares can be obtained for a nominal price at almost any junk yard, is revemped and used as a tnotor with either 110-volt alternating current, 110-volt direct curreal, or thirty-two-volt direct current. The other parts, which include a standard type of threejaw, balf-inch-capacity keytype thuck and a doubleaction trigger switch, are then assembled. The completed drill is said to have a great variety of uses in the bome workshop.



#### YACHTS AND FISHING BOATS GET RADIOPHONE





Under Your Microscope

NDER the naked eye alone, comold and new have an alloring gline for the collector Stamps, too-pictorial stamps from all over the worldhave their strange glamour for him, as be appreads them out on the table before him.

But when he adjusts the mirrors of a compound microscope and peers through the eye piece at one of his treasures, he begins at last really to see and to enjoy the charm of remarkable details otherwise invisible

Even if you are not a collector, you can, for one cent buy several hours of fascinating entertainment. First, use the penny as a specimen for your microscope; then go to the post office, buy a one-cent stamp with it, and spend another evening exploring the mysteries of that bit of paper. You will learn facts about coms and stamps that you never before sus-

For the study of stamps and coins, almost any microscope capable of giving clear images is suitable. Low magnifications, from ten to forty diameters, are more useful than higher ones. Perhaps the best instrument for the study of such specimens is a binocular microscope of the Greenough type, but this seldom as available to amateurs.

Because a coin is not transparent, it must be viewed by reflected light, that is, light falling on it from above or from one side. Such nghting at this is not difficult to arrange, particularly with the low or moderate-power miproscopes. Simply to place the microscope be-



A LIGHTING TRICK Microscope with aubitage mover placed above the stage lot examining compand stamps

fore an open window, will, in many cases, be sufficient. At night, the comcan be illuminated by a sixty-watt amp close to the microscope stage and somewhat above it, and equipped with a shade for keeping direct rays from the

The Se

Many amateurs' microscopes are fitted with a substage mirror that can be removed from its customary place below the stage and attached. by inserting its mounting pin into holes drilled in the microscope arm, at one or more points above the stage. The mirror may then be tilted until it throws a beam of light on the coin. II you have a miscroscope illuminator equipped with a concentrated-filament bulb and a con-

or is farmer. At the si-

1 the paper fiber. 2"



Unsuspected Wonders Found in Ordinary Coins and Stamps by Examining Them at Relatively Low Magnification and with Simple Lighting

#### By MORTON C. WALLING

When cours, metals and the like are photographed without cleaning, polishing or coaling, such details sometimes cause trouble

A method frequently employed in such cases is to coat the surface of the comwith a thin layer of ammonium chloride This is a white substance, which can be laid down in so finely divided a state that nunute scratches and similar details are painted over without being concealed. sometimes such articles as shells and fossils, which are to be inspected with a microscope, are given the ammonium-chlorade treatment to bring out details of structure otherwise invisible

To coat a coin with ammonium charide involves the building of a simple generator from three bottles, some glass lubing and a few pieces of rubber bose fitting lightly over the tubing. The bottles must be equipped with tight corks. Bore two holes in two of the corks, and three in the other, to receive the glass tubing. Cut and bend pieces of glass tubing, insert them through the rorks, and connect the pasts with rusher hose as shown in the illustration. One of the bottles, the one with the three-boled cork, serves merely as a safety trap. Air forced into it travels through the hose and bent glass tubes to the two other bottles, the outlet ends of the tubes being near the buttoms of these bottles. The glass nozzles projecting from these bottles have their made ends flush with the bottoms of the cocks. In one bottle place a small quantity of concentrated (fuming) hydrochloric acid. In the other, place a similar amount of strong ammonia water

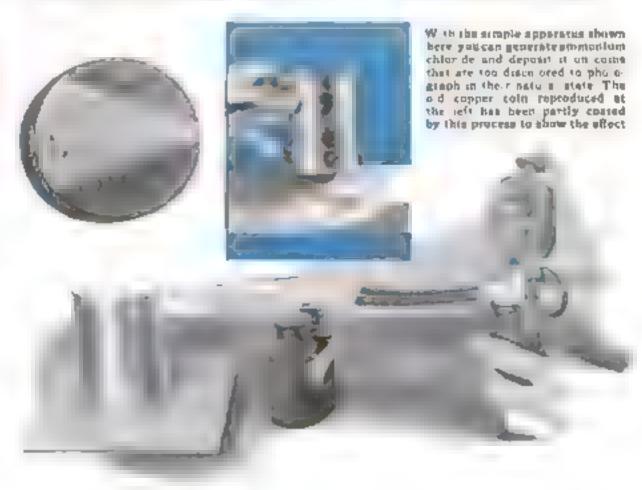
You can horse air into the first bot eor trap with a rubber buth or by blowing

through a piece of bose attached to the glass meet tabe. This air moves into the be ties containing the acid and ammoniabubbles through these boulds, and emerges through the nozzles, heavily charged with ammonia and acid vapor. The openings of the nozzles touch. As soon as the vaport emerge, they combine to form the smokelike ammonium chloride. Although the air trap is not necessary, it is advisable because it prevents acid and ammoous from being sucked into the mouth accidentally, and from being forced backward by sudden release of pressure.

Coms, to be coated, should be perfectly clean. Scrubning with soap and water as sufficient. Lay them on a flat surface and turn over them a clean tip can in one side of which, pear the bottom (the top, when it is over the coms) a hole has been punched. Insert the noxies of the ammanium-chlaride amoke generator iron this hale. A few nuffs of air through the generator will fill the can with dense, grayish white smoke. Allow this smoke to secile for three or four moutes, and then dow in another amoke charge. Uniting until the desired conting has been burn up. Avoid excessive deposits. A thin, grayash white coating is descrable.

Care must be taken to prevent too much acid vapor from entering the canand settling on the coin. Copper coins, particularly, may be damaged in this way B tree try the scheme first with a common penny. As soon as you have completed your examination, wash the animonium chloride off with water. Flaking of the deposit generally indicates that the metal in being attacked by acid droplets. To make sure that (Continued on page 96)

#### GENERATING AMMONIUM CHLORIDE FOR COATING DISCOLORED COINS



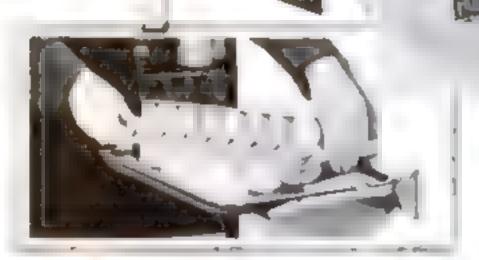
densing lens system, you can direct a light beam of the desired intensity and color across the corn, using the above-stage mirror as an aid for fliammating the shadow side of raised designs.

In general light falling across a comalmost horizontally will create sharp shadows and considerable contrast, but light falling from above, as it does when a vertical illuminator attachment is used between objective and eyepiece, will give virtually shadowless lighting. Each type has its advantages, although for most work, sharp shadows should be avoided.

Frequently, details cannot be seen as plainly as desired, because of bothersome reflections from highly polished areas, because of discolorations, or other reasons.

# New Household Utilities

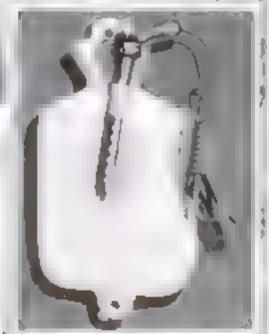




ELECTRIC SCISSORS Designed on the princapte of barbers c'appers these new c'actrac se most will, cut the most de teere ch finn or the beaviest b'enker material without a glip



TEA STICK Tes is made to the cup to add and vidual tasts with they new device. It also has the advantage of economy. The staves are removed by taking off the handle



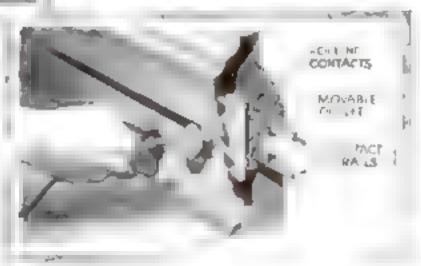
CRUSHES ICE CUBES Turning the cubes into prushed on is an easy task with the device shown above. One or two cubes, placed in an ord-nazy kitchon glass, are crushed with a few downward atrokes



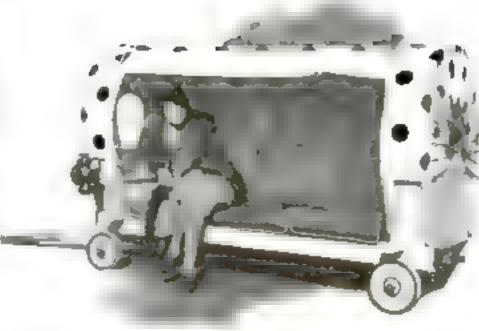
PIE CUTTER AND BERVER The otensal shows above is hardy for cutting pie or cake and lifting it from the past. It is especally useful for removing a pre that tocks

ELECTRIC HEATER FOR HOT WATER SOTTLS. A heating stoit that acrews late the neck of an orderary bot water bottle keeps the water at the degree of heat desired

MOVABLE ELECTRIC OUTLET Rolling on current-carrying rates within the baseboard. the receptacle shown at the right can be shifted to the most convenient position to the touts for any given purpose







PRAIRIE SCHOONER LAWN SEAT Built to resemble the covered wagons of pioneer days this lawn acet is bink comprish a and attractive. In addition to adding a stribingly realistic nutre the wheels make at simple to move the seat when the lawn to being aprobled or moved.





CABINETS IN FOOT OF BED Space usually wanted at the foot of a bed to put to good can to this practical piece of furniture, providing a drawing table and space for shoes and construct.



BUILT IN FISH BOWL A new write e for the home is an allum nated fish bowl set flush with the wall. Fresh water circulates continuously through the aquantum and fish are fed by means of a door I he section that aways out of the paneled wail.



WINDOW TRAPS BUR-OLARS The window shows at the eft is equipped as a burg'at trap II a promier true to enter the window snaps down on hith while a cometa taken his picture and an electric sharm bell in rung



LAMP CLAMPS ON STOVE Light for cooking is supplied by this handy demountable ump. It clamps on the back of the range

## All-Wave Electric

#### COSTS LESS THAN

Compact, and easy to make, this little giant gives set-builders what they have long wished for

This three tube oudspenker a good laoking lis cab net has an ornate trackie finview showing general plan of chasand speaker soldering on the extension shown, however, it can be fastened to the rear of the front panel and controlled by means of the convenient knob-

To save space and to prevent unnecessary overheating, a power cord baying a 290-ohm, built-in filament resistance la used in the A.C.-D.C. power supply. This resistor reduces the 110 volta supplied by the regular house lighting line to the eighteen or more volts required for the series-connected heaters of the three 6.3voit tubes. The combination potentiumever and power switch, also used to have space, is a standard volume control with anap-on switch.

As with all simple all-wave receivers, four-prong plug-in coils designed to operate with a .00014 microfarad (mfd.) tuning condenser are used to change the circuit for the various bands. The coils shown are of commercial manufacture; four units serve to bring in the shortwave bands, and the fifth provides broad-

cast reception

If a few timple rules are followed, the wiring of the receiver should cause little difficulty, Simply place the wires as shown in the diagram and photographs. As you progress through the circuit, short cuts. such as using the chassis as a common grounding connection, will suggest themselves. When each connection has been made, pencil a check on the diagram to indicate that that wire has been cared for

The rectifier socket and combination power cord and filament resistor provide a good starting point. On examining the power cord, you will find that three leads sprout from its end-a white lead, a red lead, and a black lead. The white lead, indicating the resistance, should be connected to one heater terminal of the '76 rectifier, the red lead to one terminal of the switch on the potentiometer, and the black wire to the plate and grid prongs of the rectifier socket. Once these connections are in place the rest of the series heater circuit for the temaining two tubes should be completed.

Particular care should be taken in wiring the four-prong socket for the plug-in corls. The various windings must be connected into the circuit in the manner shown in the diagram,



IVING loudspeaker reception and operating on either alternating or direct current this simplified three-tube, all-wave receiver fills a definite need for the amateur. It is an easy to build as a battery set, requires only a short antenna and no ground, and costs less than thirteen dollars complete, for parts.

Three up-to-date short-wave tubes form the basis of its regeneralive-detector circuit and 110-volt A.C.-D.C. power supply A 6D6 detector and '38 amplifier perform the receiving functions and a '76 serves as the rectifier. Because of the similarity

of the tuber, a type '78 can be substituted for the 6D6 with-

but altering the circuit or changing the socket

Mounted on a roomy 73/2-by-6-by-1043 inch chases the parts as shown are arranged to do away with complicated wiring and to allow short leads. On the top face, symmetrically located, are the three tabe socke's the four-prong coil socket, the audio thicke, the electroly is condensers (C8 and C9), and the main tuning condenser (C2). In the two- and one-half-each space unner the chassis are the fixed resistors R4, R5, and R6, the fixed condensers C4, C5, C6, and C7, and the incidental wiring Holes through the chassis serve to take the grid cap leads and connecting wires

The combination potentiometer regeneration control (R2) and power switch (Sw.), the resistor R3, the magnetic speaker and the antenna condenses (C1) are mounted behind the front face of the 6 by 12 by 12 inch cabinet. Although an aluminum cubinet could be used, the crackle finish steel unit shown gives the completed receiver a professional touch and accounts for less than two dollars of the total cost of the parts.

With the exception of the antenna condenser (C1), standard parts are specified throughout. Like the trimmer condenser used in several receivers already described (P. S. M., Oct. '34, p. 63 and Aug. '34, p. 67), this unit consists of a simple postage-stamp 3-35 micromerofand (mmf) balancing condenser supplied with an extension rod and a knob for easy adjustment. Ordinarily, these condensers are mounted under the chassis and must be adjusted with a screw driver. By







These close-ups of the auteum condenser abow how arm is soldered on

# Receiver 513 TO BUILD

the +F and P terminals serving for the tickler and the G and -F for the grid coil on most standard commercial coils. Check the prong connections inside of each coil form before completing the actual wiring, if they differ from the tisual practice, change the connections in the circuit accordingly to keep both windings in their proper relation.

In making the connections to the socket of the

6D0 detector tube, notice that the suppressor and cathode are connected together. Similarly in the wiring of the '76 rectifier socket, the plate and grid

terminals are interconnected

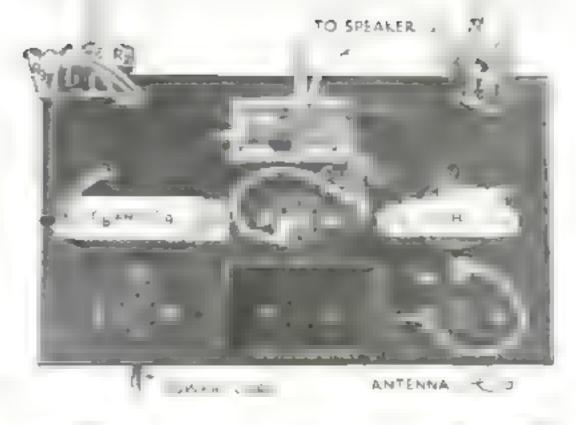
When wiring the tuning condenser (C2), the gradleak and condenser assembly can be sordered directly to the terminal for the stationary plates. In a simiar way, the fixed resistance R3 can be mounted directly on one end terminal of the potentiometer R7

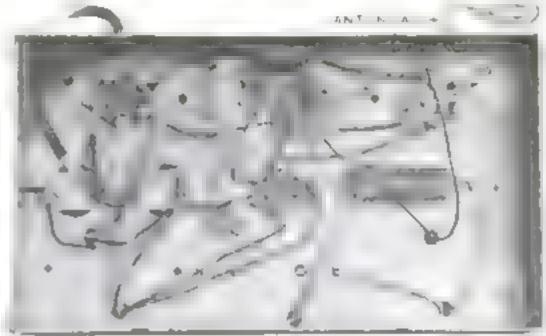
A three-sided metal partition such as shown in the photographs serves to shield the plag-in coil it is bent from sheet metal and fastened to the top of the chassis with screws or bolts. Make it large enough to allow easy access to the coils

Another improvement not incurporated in the receiver shown would be to supply a two-circuit jack in the speaker circuit. Simply pagging into the jack then would cut out the speaker and allow phones to be used. The jack could be mounted on the front panel between the speaker and the top of the tuning concerner dial.

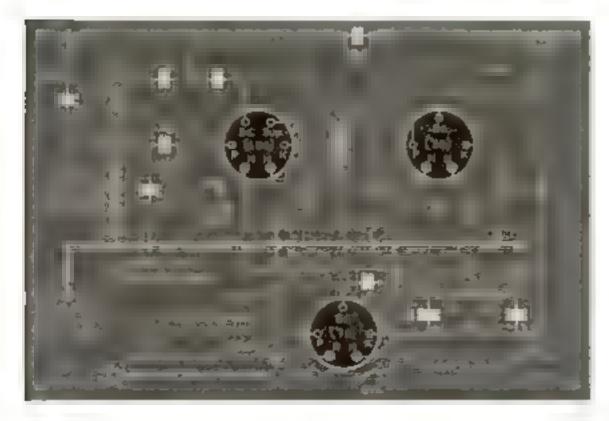
When operating the receiver, use a good outside antenna and no ground. For best results, the antenna abound be about seventy-five feet long including the lead-in. Place the set as close as possible to the window that serves as an entrance for the lead-in in order to reduce their winns to a minimum.

If, when using the set on direct current, you find that it faus to operate even though the tubes light reverse the position of the power plug. Remember there is a positive and minus to direct current power lines and they must be connected into the circuit in their proper relation. On alternating current, any position of the power plug will supply the necessary current for the circuit.





The apper photograph shows the chaosis from above, and brings out placing of the beckets to Landthe tuning condenses foreign picture. I sustrates sample waring



Working from diagram presented above, check each wire as you connect it

#### What You Need To Build This Receiver

C - Vareous tributer condenser, 3-36 mink.

1 p=3 anable condenser .00014 mfd.

4 and C,-Peard contensors, 2001 mld.

C.-Freed passbenser tabular. Smild

Co, and Co-Picod condensess, tubular 42 mile.

C, and C,-Two A mid. electrolytic condensaria

M.-Grid teak resistance 5 megalims

R,-Fotestiometer, with power switch, \$0,000 atoms.

R,-Fined resistance, 100,000 opens.

A,-Pinet resistance, 50.99 obras.

H,-Freed resistance, 3,000 ohms.

N.—Fixed resistance, 2,009 otens.

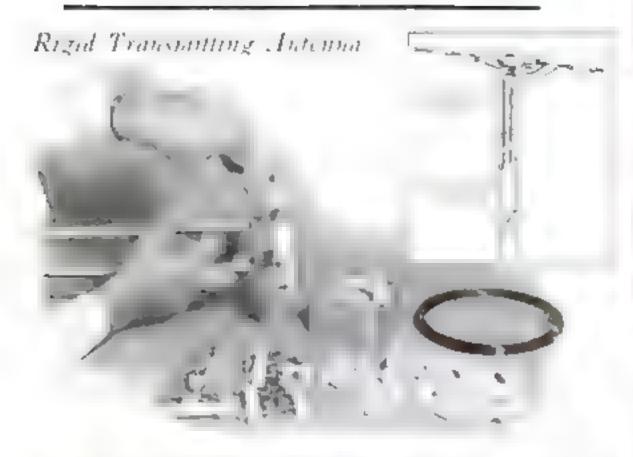
H<sub>1</sub>—Pitament resistance, built late power surd,

Ch.-Audio cholos, 800 henry.

Muscellaneous: Magnetic speaker (5 to.), two fiveproag water sockets, one six proag water socket, one four-proag water socket, two metal first cap connectors, chaptes, enhined optionall, one set of plug-to colle, dial, impose, power cord with boilt its falsebest resistances, wire, solder, screws, asc.

### SIX NEW KINKS

FOR RADIO ENTHUSIASTS



MPLOVING half-inch-diameter toling in its lead-in, a new type of
doublet transmitting antenna is now
available to the short-wave amateur. Its
rigid construction makes it possible to
match the antenna accurately to the transmission line without the losses generally
associated with the flexible wire lead-ins

of most doublets. According to its manufacturers, it provides 100 per cent more radiation than the common doublet for the same power and provides matched impedances regardless of the transmission line length. Although primarily a transmitting antenna, it can be used for receiving.



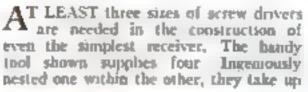
#### A Three-Purpose Tool

A THIRD hand for the amateur set on the form of a combination clamp, retriever, and test prod. Anyone who has made receiver meter tests knows how hard it is to hold the two test prods in place and at the same time turn the controls. With the prod shown, rigid spring jaws serve to hold it in place. If a nut or screw is accidentally dropped into the depths of a chassis, the jaws of the prod also can be used as a retriever; when you are making a soldered joint, they can serve as a clamp to hold the wire in place.

#### How to Make a Handy Rack for Spare Coils

BY FORMING a narrow flange or shelf along the top of the panel on your next home-built receiver you can provide a convenient rack for the plantin coils. Holes drilled slightly larger than the prongs on each coil and placed in the same relation will serve to hold the units in place. Also if desired, a label can be mounted in front of each coil to indicate the wave band covered.







Plagers select timest of nested screw privers



#### Slide-Rule Disk Finds Short-IV ave Stations

DESIGNED along the lines of the familiar circular abde rule, a new commercial shortwave log and station finder serves as a convenient guide to the principal transmitters of the world. A single setting of its rotating arm gives the day and the hour of broadcasts, the frequency in kilocycles, the location by city as well as nation, and the call letters for any one of ninety short-wave sistions. It provides a simple way of tracking down both local and foreign broadcasts and eliminates unnecessary dial twisting



One metros of the hand well insert serve coils in rack

#### Self-Tapping Screws

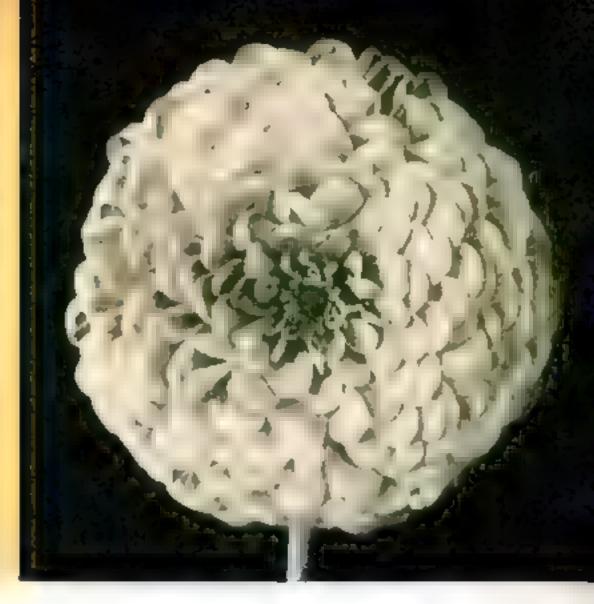
at hand when needed. The timest unit is

particularly vasuable for adjusting the

microscopic set accews on most dials.

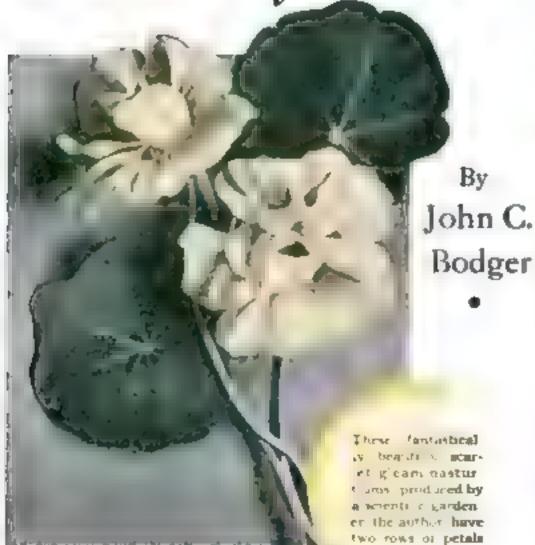
By BORROWING a production kink from the set manufacturer, the amateur can save himself a great deal of time and trouble. Few commercial chassis are now assembled with machine screws and nuts. Instead, self-tapping machine screws are used and the same idea can be applied to the home-build receiver. Requiring no nuts, they are simply driven like a wood screw into holes made in the metal. Their special threads cut into the metal like a tap





You, Too, Can Create

Beautiful New Flowers



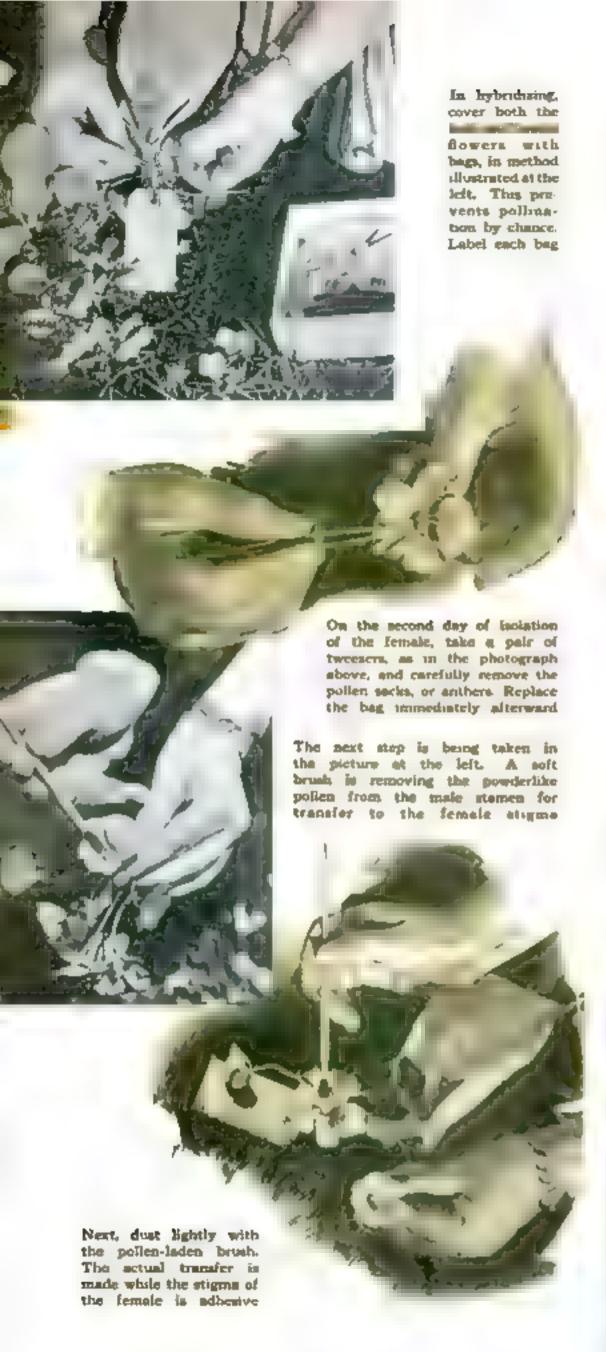
ILTING in the hot sun that beat down on the dired-up patro of a home in Mexico City, a handful of what once were thriving nasturtiums strugged for life. They were I had been told, double nasturtiums, flowers to care that only two such plants were to be found in the I nited States.

Like a prospector on the trail of gold or rare jewels, I searched the trighborhood. At last I returned to my home in El Monte Calif. sure I had the only fouble golden-yellow nasturtiums in the world. Earlier, I had acquired the only two known to exist in my own country.

I planted the seed in fertile soil. During the first two years not only beautiful double golden nasturtions, each flower containing two rows of petals sprang up, but also several sports, or variations, including some scarret flowers.

Here I had the key to a new species—sought by every enthusiastic horticulturist. By selecting sturdy plants bearing double golden flowers I made that strain permanent. Lovely indeed were the offsprings of those once-shriveled plants, which, but for a chance discovery, soon would have been lost to the world. And again, by crossing and selecting plants bearing scarlet flowers. I soon evolved the double scarlet nasturtium, and from it I bred other colors, new beauties.

Chance discoveries such as this, and the efforts of amateur gardeners, give the world many of its strange and gorgeous flowers. Many species are comparatively unknown, born to blossom for functors only



Right, erect four protective walls of cheesecloth or a course muslin. Plants chosen to become parents of new floral fantance must be shielded as this one is

Whether new or old, rare or common, sturdy or weak, all flowers require care if you wish to obtain from them the utmost in beauty. They suffer diseases exactly as do burnans; they die from thirst and hunger. wilt in cold weather—but hit their heads proudly to blussom and bloom in lovely colors when given freedom in soil and the kind treatment they need

The amateur fancier can do more than merely to raise orthodox strains. He can convert his greenhouse or garden into a scientific laboratory and produce his own new species with relatively little difficulty, provided he observes a few simple rules and crosses flow-

ers of the same species.

Never try to cross a rose and a zinnia, it simply cannot be done. You can however hybridize any common flowers grown from seed. The nasturtium, snapdragon larkspur or sweet pea can be crossed with comparative case. Asters and annual will prove more daff. G. L

Suppose you decide to cross a large flowering single red with a smaller double yellow. Here are the steps

Choose the parent plants when they first begin to flower. Mark each carefully with a tag or stake. On each of these plants, select the particular flowers which you want to serve as parents. Cover them with small manila sacks clipped shut at the mouths, to keep out stray pollen with which the flowers might be impregnated by wind or bees.

Hags and clips for isolation, acissors to trim away superfluous petals, tweezers to remove pollen parts, and a brush for transferring poilen from the male stamen to the female stigma are all the tools you need,

Having encased the female flowers in bags, isolate the male parent similarly, to be sure of a pure creas. Select a alightly older male flower, to have it ready for pollination when the stigma has become receptive To determine the receptivity, remove the bags every day or so and examine the flowers. When the stigma becomes sticky and gummy, it is ready to hold the pollen. Care must be taken to avoid chance crossing with some unwanted strain, because bees sometimes carry pollen several miles, and the wind carries it as far na two city blocks

On the second day after bagging the female, remove the pollen anthers, or sucks, before they open out, by nipping with tweezers. Replace the bag and leave it in place until the stigma becomes receptive When examination reveals that the stigms has become sticky, and that the pollen is ripe on the male take all the police you can crowd on the bristles of a small brush and transfer it to the female. The pol-



leo, which suggests a small powder puff should be dusted lightly on the stigma. This done, bug up the flower again and let the seed set from two or three weeks, to ripen.

Successful prossing is not a short process, to be completed in a few days. Nature must be permitted to take her time. Plant the hybrid seed the following year, then observe the results of your cross. If you have crossed a large red flower with a small double yellow you may look for a large double red. However, do not be disappointed if the results are imexpected, plant the resulting seed.

Often at this stage in hybridization gardeners decide that the cross has not taken. The apparent failure may result because some desired characteristic such as size or color is recessive, or covered by some dominant characteristic. For in stance, if you cross a tall and a dwarf you may get more small plants the first year; the second year, large and small may be equal in number, and in the third season, if you have continued to select seeds from the tallest specimens for planting, tail, vigorous plants should predom nate

If you happen to get a double red in the second generation when crossing take immediate steps to prevent chance cross ing, particularly if you have other plants of

the same family near-by-

The plant may be easily and mexpensive ly Isolated. Drive four laths into the ground to form a square. Wrap a length of cheese cloth or coarse muslin around the stakes, pull-II down to the ground, and draw it nearly shut. at the top. By using course-grained clothyou permit the air to reach the plant, yet prevent the entry of insects and pollen. It is not necessary to conduct these expenments in a greenhouse, if rain threatens out doors, cover the plants with lath and burlap to keep the water from beating them down

By selecting carefully only those plants which show the colors, sturdings), and other characteristics you desire to develop, you should have, after the third generation a new species in which you can take delight. It will be a creation of your own imagination

and gardening sk le

Zinnias are among the most satisfactory flowers for the average garden because they

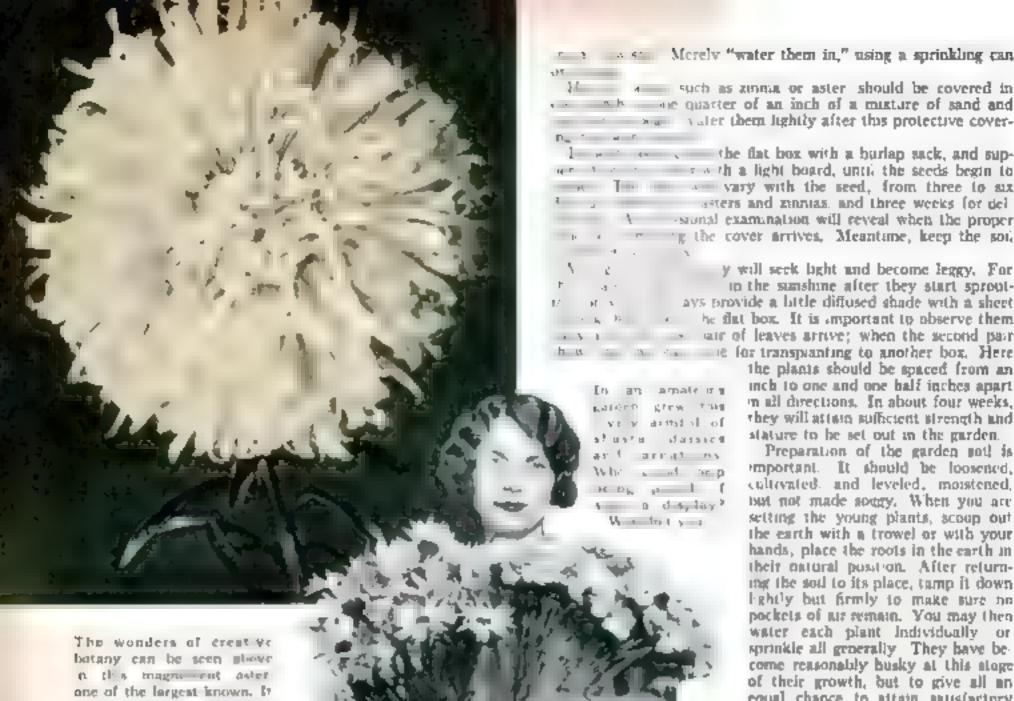


are practically fool-proof. What the hybridizer has accomplished with them, and with others, is well shown in the eighteen varieties, of eighteen colors, now on the market. All came from a single crimson date a-type zinnia which I found in a field of double giants at El Monte, eighteen years ago-

This flower had the shape of a show dah ia, with upstanding dahlialike petals. After discovering the specimen, I followed the plan I have described, for hybridizing. I planted the seeds from the crimson beauty, and carefully isolated them. The first year they threw flowers of four different colors. These four threw still more colors the second year. I found they hybridized easily, and as time went on by crossing the desired shades, I obtained true and permanent colors. Today the great-grandchildren of that sport have the largest flowers of all zinmas marketed. From that one plant, gardeners throughout the world now enjoy a range of colors once thought impossible,—the offspring of the native Mexican plant called "eyesare of the balksides"—a single acraggly dull-grange or reddish-magenta flower once considered unworthy of purposeful reproduction.

Your garden, whether atop an apartment roof or covering a spacious yard, will be what you make it. Plants respond to





k ndness in the form of food and moisture Their growth responds direct 5 to the naof their surroumangs. Lake choosen, they

st called the Super Gunt

should be given the right start in life Although most perennials and annuals do not require an indoor start from seed, you may desire to plant some of the smaller seeds—such as petunias, asters, and anapdragons-in a greenhouse, or on the back porch, before the nutdoor season is favorable. These simple suggestions. which are universally followed by professional growers, will help you.

First, provide yourself with a shallow box. It should measure about sixteen by twenty inches and be four inches deep, with boles in the bottom for dramage. Put in a layer of coarse gravel, not more than three quarters of an mich deep

Meanwhile, prepare the soil. It should be a sandy loam, consisting of dirt, sand, and leaf mold, rotted leaves, or commercial peat, mixed in equal parts. The proportions may vary stight ly, according to the heaviness of the soil. Moisten the soil as you mux it with a trowel or with your hands, but do not soak it. Fill the box so that the soil will come one bail inch from the top, after it has been tamped with a flat board. Make sure he corners are level, so that water will not coect in little poors to seak parts of the soil when you use the sprinkling syringe

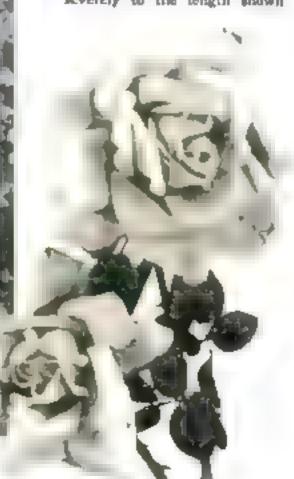
Scatter the seeds over the tamped surface, using a sower resembling a tobacco pipe. They may be broadcast or dropped in rows one inch. apart. I prefer dropping them, because the seeds will thrive better when not sown too thickly When you are planting very fine seeds, such as primruse or lobella, it is not necessary to cover has been been selected to another box. Here the plants should be spaced from an inch to one and one half inches apart in all directions. In about four weeks, they will at two sufficient strength and stature to be set out in the gurden.

y will seek light and become leggy. For in the simshine after they start sprout-

ays provide a little diffused shade with a sheet

Preparation of the garden soil is important. It should be loosened, cultivated, and leveled, moistened, but not made sougy. When you are setting the young plants, scoop out the earth with a trowel or with your hands, place the roots in the earth in their natural position. After returning the soil to its place, tamp it down lightly but firmly to make sure no pockets of air remain. You may then water each plant individually or sprinkle all generally. They have become reasonably busky at this store of their growth, but to give all an equal chance to attain satisfactory growth, the soil, if poor, should be ennebed by barnyard manure or commercial fectilizer. This may be apphed in (Continued on page 108)

> Righly hund, full bodied roses like these can be grown by enyone who has a knowledge of care of the soil, pruning, and hudding. After flowering, bushes must be pruned back severely to the length shown



### uestion: How were patients of ancient times anaesthetized? E. H., Dover, N. J.



A.—Attournt was used a great deal, and also the jutes from tertain plants, such as opium. Egyptian surgeons, it is said, developed a way of hitting the patient on the head in just the right place to produce barmless unconscinument.

#### First Candle Power

R. W., 10131VILLE, EV. Because of early methods, the term candle power is used as the unit of light. Eurly scientists, desering a means of comparing light intensities devised the standard candle made of special was and to a specified size. Although the comparison now is made electrically, the old term still is in almost universal use.



#### The Robin and the Worm

P H F., ESCHMOND, VA. According to a recent report by naturalists, robins locate their dinners by sound, bearing or perhaps feeling the vibrations and noises made by the worms on they traval through the ground. On the other hand, since naturalists also believe that the worm can hear the footsteps of the birds, it must resolve into a game of bide and seek. The bird, of course, is often the loser

#### Oxygen Is Brain Food

T W A., LOS ANGELES, CALLY. The human brain is extremely sensitive to the least lack of oxygen. In a recent test, a university proteam, placed in a room supplied with mr having only one half its usual amount of nxygen, insisted heatedly that four times four are twelve. His answer, however, did not indicate a lack of knowledge of elementary mathematics, but of a vital element

#### Keeping Windshields Clear

K. D., NEW MAYER, CONH. A solution for preventing rain and other moisture from collecting on the windshield of your car can be made by heating one and one half gallous of water to builing and adding one ounce of sodium oleste and one ounce of afyceria. Boil the mexture for about five minutes and then. after immersing a so able costs in the iquid. both it fur ten minutes more. To use the prepared cloth after it has been removed and allowed to dry, simply mosten the glass and run the cloth over the surface once

#### Deepest Oil Well

W. G. S., CLEVELAND, D. Located in California, the deepest oil well in the world, extends some 11,000 feet below the surface

#### Frost-Bitten Plants

Q-now poes frost kill a plant or flower?

P T P, K agston, Ontario, Can

A-sacu tray cell in the structure of a

plant contains a small amount of water When this freezes, it expands, reptures the cells, and halls the plant

#### Quite a Poison

V B G., PITTINCHGH, PA. A Inxin produced by the germ which causes botulasm, a variety of food pononing, in the strongest ponon known One spoonful of it would be enough to kill all the inhabitants of the curt's

#### White Cats Deaf?

Q-es these any truth in the statement that most white cats are deal?-J. L. A., Buffalo, N Y

A .- ALTHOUGH desiries and albunism sometimes go together in autmals, poor eyesight is a more prevalent common quality. The lack of pigment in the eyes allows too much light to reach the retina-



#### Snowing Snowballs?

O. waty, after a recent show storm were northern New York farms covered with but snowballs?—J K. B., Plattsburg, N. Y.

A WHILLING wind undoubtedly rolled bits of snow along the snow-covered ground as a child does when making large snowballs. The top snow being most, adhered, and the balls increased in size

#### A Hard One on Water

Q which is the most common type of water bard water or soft water?-I F. Kunsas City. Mo-

A .-- ACCOMMENT to a recent survey made of water supplies in 670 cities, four fifths of the homes are supplied with relatively soft

#### It's Gold To Some Folks

Q .-- that vision motion picture film any par-

ticular time?—S. H., Watertown, N. Y. A. er in decidedly variable. In one large plant in Hollywood, \$17,000 worth of silver is reclaumed from every J50,000 feet of old sound truck film.

#### Average American Man

J. W. R., TUKON, ARR. Although males from your section of the country usually are tall, the average American man measures approminately five feet eight toches to bright

#### A Natural Remedy

О-wifer was petroleum first discovered and used?-О. R. D., Atlanta, Ga.

A .- stranning enough, petroleum first appeaced as a medicine. In 1849, a Pittsburgh druggest found some oil in a nearby brine well. Deciding it was a fine remedy for a variety of ills, he buttled it and offered it for sale at fifty cents a half pint. At Thurville, Pa., ten years later, the first oil well was constructed, and the great boom began.



#### Shocking News

D F V., Jr., av Louis, Mo. Large electric teb are capable of giving shocks up to 200 volts. The electricity, thought to be generated by muscles in the eel's body sometimes can even penetrate thick rubber gloves

#### Moon's Mountains

H. G. F., statzla, waste The largest mountains on the moon are thought to be 25,000. feet high, its craters are 24,000 feet deep

#### High Flyers

F T C., bestyre, cond. Adhough no accurate record of the altitudes reached by birds has been kept, climbers on Mt. Everest have reported seeing turiews at 20,000 feet

#### Both Have to Eat

Q.-us or true that only the female webspinning spider builds the webs?--R. W. M., Boston, Mass.

A .-- so, norm the nucles and females build webs, but because the mase often lives with the female, a great (Continued on page 202)

# Experiments with Alloys

## FOR THE HOME CHEMIST

# By RAYMOND B. WAILES

This simple equipment will demonstrate how automatic water appositions operate in eximpushing free. Heat from the flame of a match matrix the plog of Wood's a tay, releasing a stream of water from the alphon substin, and finally four parts of besmuth and one part of cadmium. During the mel ing process, here the meta's carefully since both cadmium and bismuth tend to take fire at extremely low temperatures.

Ry making use of the low me ting point of Wood's alloy, the home experimenter can prepare a mystifying trick spoon that will fool even the most suspicious of his tiends. Naw an nexpensive teaspoon in half and then, using the Wood's alloy you have made, solder the two halves together again. This can be done by applying soldering fluid (zinc chibride will do) to the came of eeges heating the two rods to remove the excess water, applying the molren Wood's mixture, and clamping the sections in place.

Acting as a soider, the alloy will sweat the two pieces together. At ordinary

temperatures, the spoon will remain intact, but as soon as it is dipped into a hot liquid, the altuy will melt and the two sections will part company. Serve the track spoon with some coffee when a friend is visiting and watch has embarrassment and surprise when it "breaks."

How the low merting points of alloys make them valuable is best illustrated by the automatic sprinkler system used in modern office and factory buildings. In such a safe y arrangement water pipes, signaging across the ceiling, are fitted with fused sprinkler heads. The fuse in each case is a link of low-melting alloy which holds a spring valve in the closed position. Any fairly high temperature, such as that caused by a fire, melts the alloy and releases the water supplied under

#### TABLE of ALLOYS

Name	Welting Point	Par Br	n by bn			e/ Hg
Laponista's	701CL 158 F	15	4	3	8	0
Wood's	66 t	4	-	t	2	0
Roses	93 ( 200 F	2	1	Q	ı	ū
D'Arcet's	90 C 176 F,	R	3	0	5	0
Solder	275 (C. 527 F.	0	3.3	0	67	-0
Fusible spoons		45	17	0	30	5-10

Bi-Bismuth So-Tin. Cd-Cadmium, Pb-Lead, H4-Mercury

EARCH through the list of true metals and you will find neither brase nor broase. To the unmitated, this may seem like an oversight, but it is not. They are neither elements nor basic metals, but two of a large and interesting group of substances known as alloys.

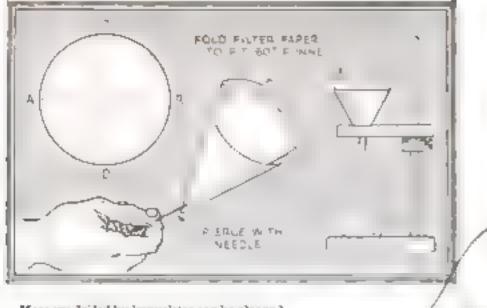
Like a solution of sugar in coffee or sand in water, alloys are not chemical combinations, but mechanical mixtures Solder is an excellent example. Athough tim and lead are mixed to give what looks like an entirely new metal, it is merely a humogeneous mais containing both of the metals in their original unchanged form

One of the most curious and important properties of alloys is their low melting point. It would be reasonable to suppose, for instance, that a mexture of bismuth, tin, and lead, with melting points of 271, 232, and 327 degrees Centigrade respec-(ively, would have a combined melting point somewhere between 232 and 327 derrees. Make up such a mixture, however, by adding two parts by weight of hismath and one part of tin to one part of molten lead, and you will be surprised to find that the product becomes a liquid at ninetythree degrees Centigrade, seven degrees below the boiling point of water and 139 degrees below the melting point of tm. Such an alloy is known as Rose's metal.

Wood's alloy, consisting of bismuth, tin, codmium, and lead, melts at an even lower temperature. To make this mixture, melt two parts of lead, then add one part of



You can play an attituding trick on your friends by making my af the low making point of Wood's alloy. A teaspoon, sawed in half and soldered together with the alloy, breaks when depped fare a hot liquid



Mercary dolled by impurities can be cleaned by filtering through filter paper in which amail hotes have been punched with a need-s

Just how this mechanism operates can be illustrated in a slightly simplified form right in your home inhoratory. Select a short length of glass tubing and plug one end by dipping it into molten Wood's or Rose's alloy. The sealing plug, when it couls, should be about one quarter inch long. Then connect this glass notice to the rubber outlet tube on your laboratory siphon bottle, taking care to see that the water completely fills the tube but does not rough the fumble plug

Finally, with your sprinkler ready, kindle a small fire of match stacks or paper and hold the pagged notate above the MERCURY flames. Even the heat from a single match will melt the alloy and allow the water to

flow from the siphon tube-

Low-melting alloys also have hundreds of other uses. In the early days of radio they were used for mounting the sensitive crystals that formed the heart of every receiver. Today, they form the basis of fusible plugs to protect modern steam boilers from a combination of excessive temperature and pressure.

Besides their peculiar low melting points, alloys also exhibit an equally curious color effect. The home chemist mixing seven parts of copper and three parts of tin could well expect that the product would be copper-colored. Yet, the mixture is

unmistakabiy white. Similarly, a five-cent

TO BROOTH GLASS TUBES

Sharp edges formed at the anda of glass tubes when they are broken, can be returned as shown in the photograph Short downward stroken with a piece of stiff wire screen take away the sharp points

The Mysterious Properties of the Large and Interesting Group of Substances Known As Alloys Offer Many Opportunities for Experiment

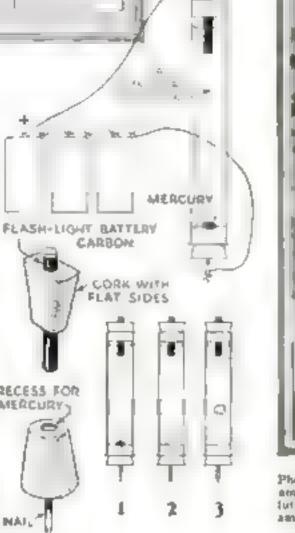




Photo and drawing show how you can make ammonium amangam. An electric current to passed through a sotution of ammonium chie de. A drop of moreury amalgametes with ammonium sat free by the current

piece contains three times as much copper as makel, yet it is far from being the color of cupper

Another currous property of alloys is their reaction to cold and heat. Like most metals, nome alloys contract when they cool and solidify; others, however, expand. It is because printer's type metal has this latter characteristic that the printing on this page is sharp and easy to read, Poured into a most such as a matrix in a finotype machine, it expands to fill every nook and corner and give a sharp impression.

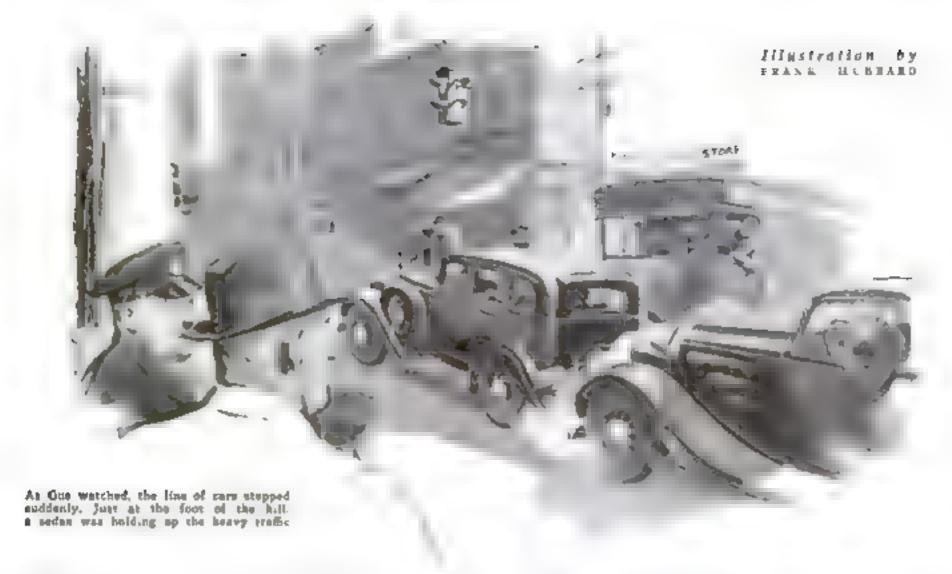
Heat it not always necessary to the formation of an alloy. Brass, an alloy of copper and ainc, can be electroplated on other metals. Gold and fead can be made to alloy simply by placing them under pressure. And, being a liquid at ordinary temperatures, mercury can be alloyed with most metals merely by bringing them into contact.

When mercury forms an alloy, the product, called an amalgam, usually is soft and pasty. Home chemists who have been so unwise as to experiment with mercury while wearing a gold ring are familiar with the silvery alloy formed when mercury amalgamates with gold. Incidentally, if the ring is solid and contains no stones, the film of amalgam can be removed by gently beating the metal for a moment. Because it combines with other metals

readily, mercury that has been used often loses its metal ic luster. This do linear caused by impurities can be removed by filtering the mercury through ordinary filter paper which has been folded in the usual way and then punched with a perdie. The dross, consisting of bits of metal-life oxide and detrital substances, will be left on the filter paper.

Besides combining with meta's, mercury also can be made to form an amagam with a curious set of elements called the ammonium group. The experiment, an amusing one, is performed by passing an electric current through a solution of ammonium chloride (sal ammoniac)

In making up the necessary apparatus, a short prece of half-inch-diameter tubing plugged at one end with rubber stopper forms the container. A nail, pushed through the stopper with its head countersunk into the rubber, serves as one electrode, while a carbon rod taken from a flash-light cell and inserted into the upper open end of the tube forms the other. A drop of mercury should be placed in the depression occupied by the nail head, the tube filled with strong ammonium chloride solution, and the carbon rod fastened over the tube in (Contonued on page 103)



### Check Up on Your Clutch

AITING on the curb for the light, Gus Wilson was ched the long line of cars start their climb up the steep Center 5 reet bill. It was the usual Sunday afternoon traffic jam.

Suddenly, the line stopped. A sedan. just at the foot of the hal, was having trouble. Horns tooted gears growled and men shouted. In spite of the plame of smoke that puffed rhythronia ly from its exhaust pipe. the car could not budge. At last, with a clanking and scraping of bampers the car behad pushed it around the corner and out of the way

Gus shouldered his way through the amall growd that had gathered around the stalled car and apoke to the driver

"My name's Gus Wilson he said. I run a garage and I thought maybe I could give you a hand. What's your trouble?"

"Blamed of I know," the man replied, fidding nervously with the gearshift lever. Everything was all right until I started up that hill. When the light changed, I put her in low, let out the clutch, and stepped up the gas. She went about for a few feet, then the motor started racing and she stopped."

'Mind if I try?" asked Gus. "You're on level ground now, and she may act

better "

Gus edged into the driver's seat and stepped on the gas. "Sounds swell" be commented, as the motor raced. "The gear shift seems to work all right too."

The veteran mechanic shifted into low and cautiously let out the clutch pedal-At lirst, nothing happened, but as he fed the motor more and more gas, the car moved unstead ly ahead like a soail.

#### By MARTIN BUNN

"I'm sorry, mister," Gus said, shaking his head, "but your clutch is shot, It's supping so badly it won't drive the wheels."
The clutch!" echoed the man, "Gosh

now I am in a pickle! Something like this would have to happen, when I'm sixty miles from bome!"

Gus pulled his watch from his pocket. "It's just two o'clock now. Why not let me goag the car over to the Model Garage. If we work fast, and have any luck, we ought to be able to fix the car up by five "

Once Gus had donned his overails and cap, he wasted no time. In less than three quarters of an hour be dropped the transmission, loosened the clutch cover, and had the main clutch assembly out on his

"So that's what a clutch looks like!" exclaimed the car owner. "Sort of a comfunation of springs and plates, isn't it?" "That's right, and it's those springs and

GUS says:

Even a car can have too much of a good thing. Overloading a differential with Jubricant doesn't do any good, and et can do a mess of harm. Nine times out of ten. the Jubicant is forced through the rear gale onto the brakes, and it spoils the brings when it soaks unto them.

plates that book up your motor with the main drive thaft when you let not the peda. This particular clatch is who is cased a single dry, are type. See this?

Gus held up a thin meta, disk almaten aches or d'ameter, on each side ic had a flat ring of hard fabriclike material That's the clutch disk. It's fastened to the shaft that drives your transmission, and rides between the inside of the flywheel and a heavy plate attached to these springs. When your clutch pedal is out the springs force the pressure plate toward the flywher coamping the clutch disk in between. Naturally, it binds against the flywbeel and turns every time the flywbeel is turned by the motor.

"Now," continued Gus, stopping for a breath, "when you push your clutch pedal down, the springs are compressed, the pressure plate is moved away from the flywheel, and the clutch disk is free."

"But what's this stuff for?" interrupted the car owner, pointing to the ring of fabric on one side of the disk, "Looks like brake hums.

"And it is something like brake lining " agreed Gus. "That's the friction surface that makes contact with the flywheel and the pressure plate when the clutch pedar is all the way out. And, incidentally, it a the one thing that wears in a clutch and causes frouble

"Take your case, for instance Your motor can swell, but it wouldn't drive the rear wheels on a hid. Why? Look at these friction surfaces. They're worn down smooth, and are only about half as thick as they should be. Of course, it wouldn't bind between the pressure plate and the flywheel. It (Continued on page 68B)

### THE HOME

### WORKSHOP

HOW TO BUILD A MINIATURE MODEL OF

# H.M.S.Bounty

The ship on which was staged the most famous muting of the sea

OR nearly 150 years the mutiny on the Banaty and Captain Bigh's 3 618-mile voyage in the ship's open much have been one of the world's most thrilling true stones of the sea. That tale

has recently been retoid so skilfully in three popular books that the little Bossity is better known and more famous than ... Many readers have therefore called for plans to build a model of her. Well, here she is

The model is in ministure form, constructed and regard as simply as possible so that a beginner may try his band at making it and so that the work will not take too long. The scale of the model in relation to the real ship is 1-12 in, equals 1-ft.

When Bigh was commissioned to find a stop with which to proceed to the Sandwich Islands, where he was to gather your, I read-fruit trees and take them to the West Indies, he chilbe merchant trader Bethig built at Hull in 1754. She was or you for 10 in, long, 24 ft. 3 m. in beam, with a hold 10 ft. of deep.

The British navy purchased her, and altered and retigged her in many astron last on the second of the wire a generic. She sailed in 1788 with a crew of forty-six in all. She had four 4-pounder pune on the quarter-deck, six swive general had to deck and two forward. I only the second only as required.

To make the hull, take a piece of pine (or balsa) 1 - bar 2 at 2 at 2 at a continuer pieces to build up to 143 in. in this kines at

can be made of secto layers or lifts as with the larger models. If you prefer the hull may be cut off at the water line and set in a plastic sea.

Cut the block down vertically to the outside lines of the half-breadth plan. These lines are about the same as the deck plan, but slightly wider amidships to allow for the tumble home. Next cut the block to the heavy profile lines shown on the sheer plan. Make cardboard templates from the body plan, and shave the sides of the full un-

Adding the final details. The size of the model can be judged by comparison with the bands. The bulk black is To in, long and the finished bulk \$1, in long The over-all length is \$15, in length \$14 in



Y where radiation the flatter Mere she is a ray to a mile the seal ship with the seal shi

POPULAR SCIENCE
MODEL-OF-THE-MONTH CLUB
By Capt. E. Armitage McCann



A close up view of the rigging of the model of ghely enlarged to show the lower man titles and caps. The mast from the tops up to the caps are find square and the caps at over them.

From hardwood or sem has denot such as gum or who ewood, out the kind of me and, one made these on and use none that these on and use none them I possed with small pins after drilling holes. The stem can come up only to the howsprit, he small topmove may be added a ter the after is in pade. The hall up to a point he stempore, From there up It is a most the stempore. From there up It is a most that across. At the day it is come to be full width of the hall.

For the outworks cut two pieces of cardboard (such as five-ply B mon board) to the shape shown, plus cut thin cardboard steps and glin them to the operages to se the bowerks and cambets of me heal in the specific but

UPPER

To go across the stern cut pieces of cardboard to the shapes shown, glue one on the shown with India out

transparent a variable green across the stein, with the ludwarks and its ends

back bangt.

extending a little beyond them. The insides of the bulwarks and taliful can be painted a light buff

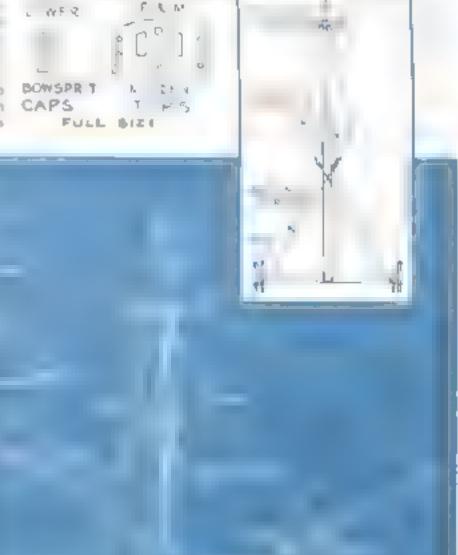
The beavy mordings (wales) I made from chair-caning spiine, but two thicknesses of cardboard will serve. The quarter badges, or windows, can be made like the stern board and glued on. The figurehead represents a lady in a riding babit, although so modestly dressed she will bave to straddle the beakhead. It can be carved. but an easier way is to make two figures of cardboard, glue the heads together, and glue the body on either side of the beak, which may be shaved a bit thinner. The trail boards can be in one piece with the figures, their forward ends being graed to the beak. The remainder sweeps in a concave curve to the hall where the after ends are glood. Holes are bored through these ends for the bawse pipes. Figurehead and trail boards are painted white and black as shown.

Out notches in the bulwarks and natthe catheads to the forecaste deck. Also make three pairs of channels as shown and glue and nail them to the hull where indicated in the rigging pap

From the bighest available part of the beak to just under the catheads glue white

> strips of wood about 1/16 in, square to form the bar calls

The bale up to the waer one can a pain ed to epicsent copper or at can be called with copper monac with some



#### RIGGING PLAN

How the model as rigged. The dimens or can be found by reterence to the scale in inches below As in customery in such plans, the yards a shown as if pointed fore and as, but in the actual updel they are rigged account the shop as is the photograpus

green rubbed in. Above that all is black, except the ornaments. The white stripe is just a strip of paper glued on after the painting is done.

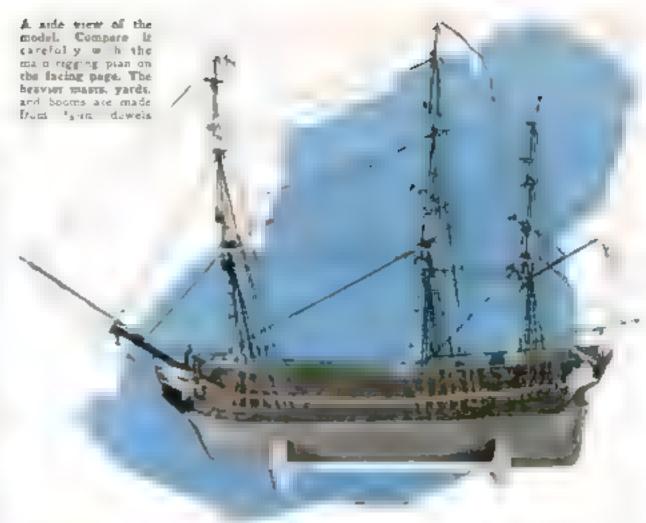
Some kind of stand may well be made at this point. That shown consists of two aprights cut to fit the hull at stations III and VII and joined with two 3/16-in. dowers. See that the model sits truly up-

Gumwood serves nicely for the deck fittings, but stained whitewood will do. The hatches and skylight are all made from a piece 3/32 in, thick. The batches gratings may be drawn with India ink and a penafter the hatches have had a coat of shelatc. The top half of the skylight is cut to the shape shown in the detail and then painted to represent windows.

The Bounty's steering gear consisted of two standards with a barrel and rope between, but for neatness and simplicity I boxed mine in. An easy way to make the wheel is to draw it on a piece of thick transparent material mich at is used in photoframes, cut away the outside only, and fasten with a 33-in. pin.

The three sets of bitts are pieces of 1/16-up, stick with the grossbars halflapped into the uprights. The two stern lanterns I made by gluing large beads and small beads on pins. The gun carriages are cut from 5/32-in. square wood, and the guns are 34-in, lengths of doctor's apphastor sticks, slightly tapered, with a pin through them for the truncions.

If you have never built a model before, do not be frightened by the nautical terms

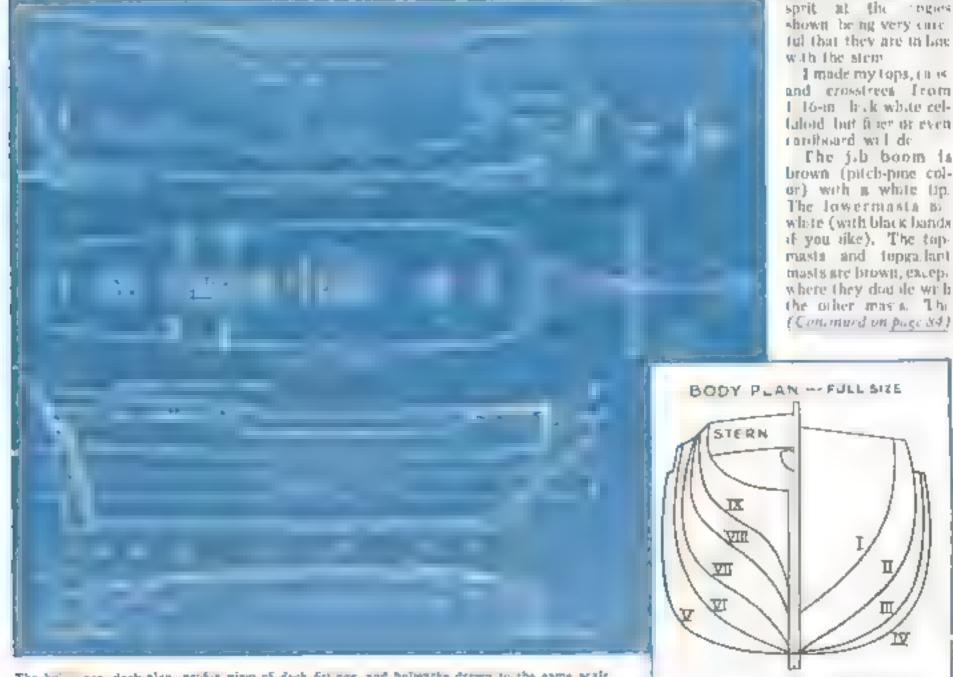


which are used in the following instructsons for rigging the Bounty. The words are clearly defined in all large dictionaries, and many dictionaries and encyclopedias have diagrams showing all standard parts of ships. Even if you should fail to identrly some of the parts accurately, just fol-

low the drawings and photographs. You cannot then go far astray

The heavier masts, yards, and booms are made from 36-in, dowel sticks, and the lighter ones from applicator sticks. Their d mensions can be scaled from the rigging plan on the preceding page.

> Hore boles for the lowermosts and howsprit at the shown being very one ful that they are in Lac with the stem-



The he' area deck plan profite view of deck firtings, and bulwarks drawn to the same scale as the rigging plan on the facing page. At the right, however, the body plan is given full size

## Lamp Garden

No sunlight or watering is required—The shade is made to match by decorating it with real ferns and flowers

By Julia I. Fox

Y FIUSHAND and I have developed lighting fixtures of various kinds, and the one that has probably aroused the most interest is the lamp garden illustrated. Plants thrive without attention within the base, which in this case is a large glass bottle known as a "balloon demijohn." The shade is also unusual because it is decorated with real Jerns and flowers to harmonize with

the lump base.

The neck opening of the buttle is about 11/2 in, in diameter, and through this is dropped a mixture of three parts rich earth to one of gravel, and one cup of powdered charcoal Enough water is poured in to moss en the earth thoroughly should mildew appear on the plants, the paug can be removed from the neck of the bottle for a sufficient period to allow the excess water to evaporate; and if the plants appear too dry sma, amounts of water can be added. The lamp illustrated has not been opened for ten months, and the plants have died down and come up as they would in their natural habitat.

Most people think we use some form of magic to get the plants in the bottles, but it is simple enough. We made a special tool from a 2-ft, length of heavy iron wire. The ends were beaten flat, and one was bent at right angles and notched. Small plants and mosses are dropped through the bottle neck, holes are dug with the long tool, the plants are pushed into them with the notched end, and earth is pied

around them and patted down.

A variety of plants may be used. We have been successful with the delicate

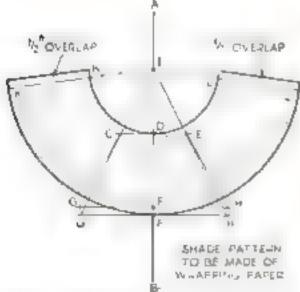


Diagram showing how to lay out shade pattern



mardenhair fern, as well as dogtooth violets, and many other wild and garden flowers. The shade illustrated at the right above has huge sprays of mardenhair fern, purple clematic, orange marigold, and Boston fern. This shade with its base is a fair example of the application of dynamic symmetry (PSM Aug 37 p 98)

Directions for making were lamp-shade frames were given in a previous issue (P S M Aug '32 p 94). We have not found it necessary to use side supports for our abades, even when they are as large as the one shown (14 by 15 by 24 in.). Tinned wire is not used, but we sandpaper the iron wire wherever a joint is to be made. A small alcohol blowtorch will be found most useful for soldering the joints, and a soldering flux is used by us even with cored solder.

THE shade pattern is made as follows. Select a smooth piece of wrapping paper thumb-tack it to a board, and draw a perpendicular line AB. Next select a point D, on AB, and draw CDE through it at right angles to the original line. CD and DE are laid off equal to the radius of the top circle of your frame. The depth of the frame DF is then laid off on AB, and another line GFH drawn at right angles. GF and FH are made equal to the radius of the lower shade ring. Connect G and C, which will give the distance on the surface of the shade between the two ranges of the frame. Lay this distance off from D on the vertical line, which will locate the point F1. Again draw a line through  $F^1$  at right angles to AB, and lay off  $G^{T}F^{T}$  and  $F^{T}H^{T}$ , which are again equal to the radius of the lower ring. Draw lines through the points  $G^1$ , C, and  $H^1$ , E, which, when extended, cut the vertical at a common point, I.

With I as a center, describe arcs with ID and  $IF^1$  as radii. Obtain the points  $K^1$  and  $L^1$  by laying off half the circumference of the lower ring on the arc, starting



The real beauty and movelty of a temp garden can be realized only when seen il unionsted. The shade consists of two pieces of paper with proceed flowers between

at F<sup>1</sup>. The points K and L are obtained in the same manner by starting at D on the upper arc and using half its circumference to locate them. You are now ready to cut the pattern, but he sure to add ½ in, at each end for the overlap.

THE shades are made from a good grade of white paper (bond paper is not satisfactory because of the watermark). After two sheets bave been out from the pattern, the flowers, which have been pressed under a weight between two sheets of biotting paper for a few days, are arranged on one sheet and (astened down with cellulose household cement Then the entire sheet and flowers are covered freely with the cellulose cement, and the outer sheet of the shade put in place, pressed down by hand until entirely smooth, placed between two smooth boards, and weighted with a single layer of average size books. A great weight is not desirable as it may cause the color from some of the flowers to run into the shade

After the shade has been dried for not less than eight hours, rub both aides with a rag saturated in boiled inneed oil. If a darker shade is desired, a few drops of oil stain of the proper color can be added to the linseed oil. Now wipe off all surplus oil with a fresh rag and new the shade to the upper and lower rings, and fasten overlaps with brass brads. Finish top and hottom with a harmonious shade of bias binding, fastened with certain oil cement

The flowers keep their colors very well as the shades are practically arranght, although there may be some fading particularly with the greens. When this happens, however, the effect is still natur-

at and pleasing.

A great deal of scientific data has been collected within recent years on the stimulating effect of actificial light to plant growth (see P.S.M., Sept. '33, p. 19, and Oct. '33, p. 33). If potted plants receive a few bours of art ficial light in the evening, it is not necessary to place them close to a window where they would receive direct similable. Plants needing much sunlight outdoors naturally require more artificial illumination indoors.

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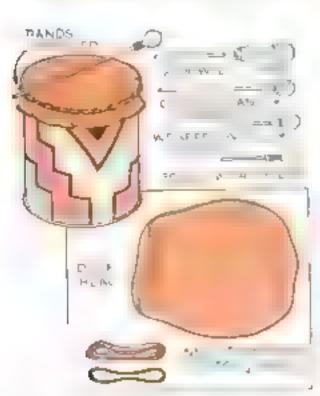
InclanWar Dance Show

Old inner tubes are used for drumheads, tomahawks, knives, and lance points—Headdresses and buckskin suits also easily imitated

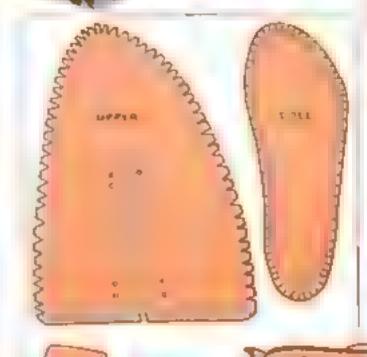
ment made mainly from old inner tubes and other discarded materials, any group of boys can put on a thrilling Indian war dance show. All sorts of Indian leather work, drumbeads, and even realistic looking tomahawks, knives, and lance heads may be simulated with rubber. Real Indian materials, on the other hand, are expensive, hard to get, and require much more time and skill to make up.

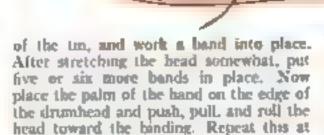
JACK HAZZARD

Drains that give a convincing Indian sound are made from large syster time or other cans headed on both ends with rubber and painted brilliantly. Cut out the bottom with 14-in, allowance and hammer in the edge to strengthen the end. For the head, first cut twelve or thirteen sections like rubber bands from an old tube. Then split the remainder of the tube and cut off a piece large enough to cover the end of the can. Hold it in place over the end



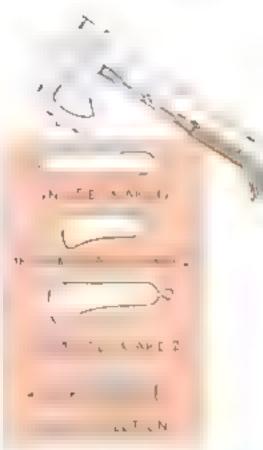
Drums are sarge the cans with rubber heads held on by bands sliced from an onner tube





intervals, turning the drum round and round, and finish with a few two-handed downward pulls. Cut away the unneeded part of the head but leave a grip all around for future tuning

A whole drum corps can be equipped in this way. A drum with one head and with the buttom of the can left in sounds like a ketile drunt; with one end open it produces a high effect; with two

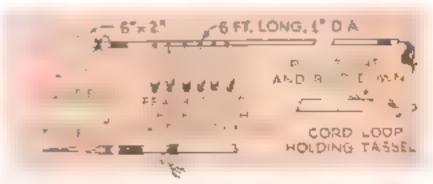


Tomahawa heads are built from places of rubber comented together, and the frieged grip in also rubber. Muccasins may be made from later tubes as at self

heads, it gives the typical Indian boom; and with hard-twisted cords stretched over the bottom head and looped through the bands, it has the source-drom rattle needed for a drum corps.

Moccasins, too, may be made from inner tube. The pattern illustrated must, naturally, be adapted to the foot of the wearer.

Lee gasoline to clean all the tabs along the edge of the upper piece and a wide stup along the edge of the sole. Dry well. Fasten a tab or two at the toe and gauge to see that the heel lap will come at the right place. Working first on one side and then the other, (Continued on page 94)



Labors like this have a warlike look but are coursely harm eas. The points and edges are trimmed thin after the cement handried

#### Plans for Constructing a HEAVY - WEATHER

### Motorboat

The Invincible Cape Cod Dory

#### ByHi Sibley

As shown below, the 40-H.P. mores in Dr. McKibben's dory is housed in a compartment held together with hooks. Top and sides gan be removed as required

cut to fit exactly, and this should be done.

No dimensions are given or he motor mount since there are several engines adaptable to this type of craft A 20st.p. four-cylinder engine will be satisfactory, and details for building the shaft log will be supplied by the motor manufacturer

Planks 1/2 by 9 in, are used on the side. They may be pine or whatever material is available in your locality for boat build-

> ing. A butten is back of the seam secured with copper rivets spaced in pairs about 5 in, aport The edges of the planks are sughtly beveled to leave a narrow V out in a which cotton lamp wicking is driven, followed by an application of marine glue. When this is dry, full the joint

with purity (Fig. 2), The calking along the chane consists of Jamp wicking twisted around small brads, the latter then being bent over and puunded in flush, as in Fig. 4. Marine glue is next applied, and the botiom planks are put on, Galvanused has a can be used for this purpose. In fact, no fron should be used in construction unless gatvarused, and brass or copper is better where possible. The buttom is carked like the sides.



Dr. Paul B. McKibben, dean of the Echool of Medicine University of Southern Califormta is his dary in which he goes for out to sea Note soom note and extreme theat

ONG a favorite with commercial fishermen who meet all kinds of weather far out at sea, the true dory is a practical boat for inland lakes as well. It combines many advantages, notably its roominess, its stanchness, and the ease with which it can be handled and launched in the surf

The original dozy design had no thwarts so that a number of the boats could be nested on the deck of a fishing schooner The model in the drawings is 18 ft. long

In Fig. 1 are given deck plan and side view. For clarity, no bettens or moldings are indicated on the former. The dory in shown with inboard motor installation, but it has a must step for rigging a sail in emergencies.

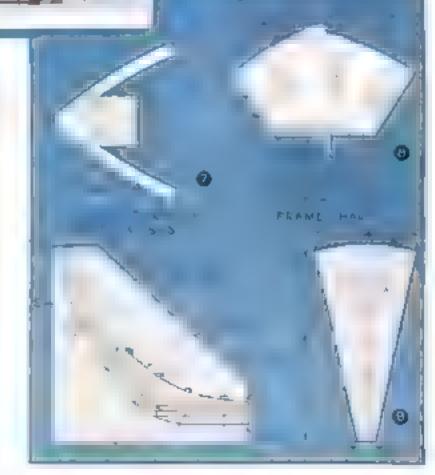
First make the oak stem approximately as laid out in the squared diagram, Fig. 7. This is rabbeted 1/2 in deep for the binnking and is secured to the keelson with an oak knee. Bottom boards and keel are put on after the aide planking is compieted. The transom is cut from 11/2 in. oak or mahogany as in Fig. 9, the sides and bottom being beveled as required,

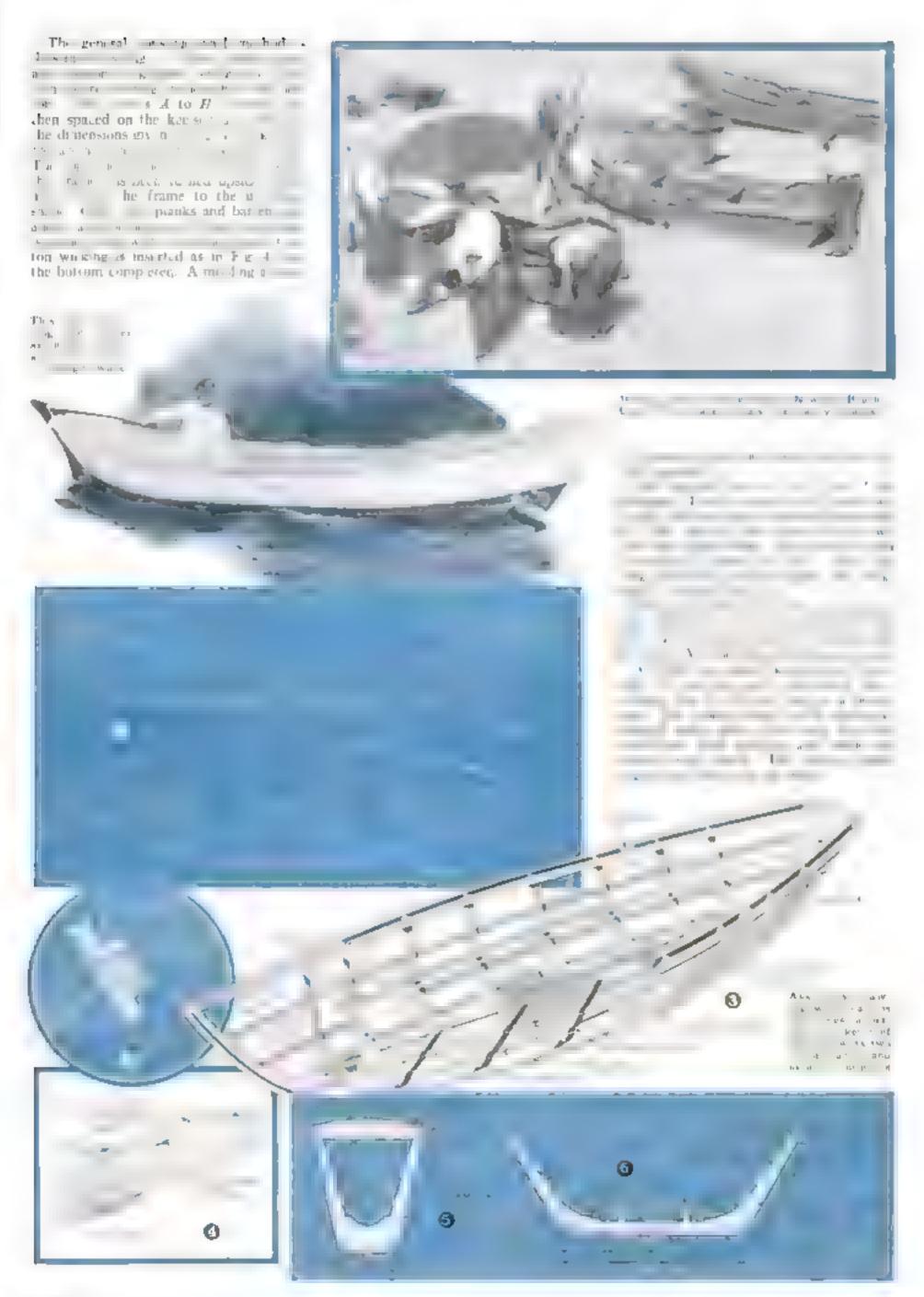
Next lay out the frame profiles, Fig. 8, full size on paper or on the shop or garage floor with chalk. Use 76-in, ook for the ribs and cross member of each. The two forward frames, A and B, have a crowned cross member on top to support the short deck. Fig. 5, but all the other frames are open. A typical frame E is given in Fig. fi. Note that the oak knees are secured with two bolts, through rib and bottom

member, and two screws The original Cape Cod dory has a metal yoke at this point

In cutting the ribs, leave 3 or 4 in, of stock on the tapered ends so that temporary crosspieces can be used as beaces until the side and bottom planking is installed. Also, the notches for the side bat tens should be about 1, in, wider than the battens to allow for adjustment since no two boards will bend exactly alike and it is impossible to give absolutely accurate dimensions at this point. Notches for the keelson and bottom battens, however, can be

Chart of frame dimensions and details of stem and transom





# Making a Mercury





#### FOR YOUR HOME

strips may be varied in size, so long as the tube stands free, is protected from accidental blows, and yet can be easily read. To make the clamps, bore holes 3% in, larger in diameter than the tube (to allow for leather pads) and rip them through the center. Tack the halves to the backboard and drill the ends to receive screws. Cut tin strips to clasp the outside of the tube. Make the cistern guard cap, add the cistern shelf, and paint the assembly with two coats of boiled linsered oil

Bore the bottle cap to fit loosely over the tube. As there is some danger of cracking the composition, it is best to drill a \u03c4-in, bole and then enlarge it with a round fite. If there is a metal-foil inner in the cap, remove it, for the mercury might attack it

Filing the tube must be done with considerable care. Pouring the mercury in and stopping the opening with the thumb as all right for an experimental barometer, but it is not satisfactory for continued use, because, in filling, large numbers of air bubbles are trapped. Many of these

By EDWIN M. LOVE

cometer to shown at left, the measurement

being taken from the level of the mercury

th the catern to the top of the column. At the right is a simple homemade barometer

of weather! Sudden sinking of the mercury means lowered atmospheric pressure, which in turn usually presages storm—an inrush of denser air cold or moisture-laden, to displace the lighter rising oir. When the column regams its normal height, look for fair skies soon.

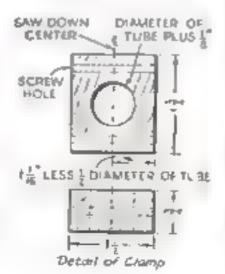
The barometer, in effect, weight the nir. To illustrate this, seal a glass tube at one end and fill it with mercury. If you close the open end with your ibumb and upend the tube in a dish of mercury, some of the liquid metal will run out, leaving a vacuum above it. Air pressure keeps most of the mercury in the tube, the amount depending on the elevation, the temperature, and weather conditions

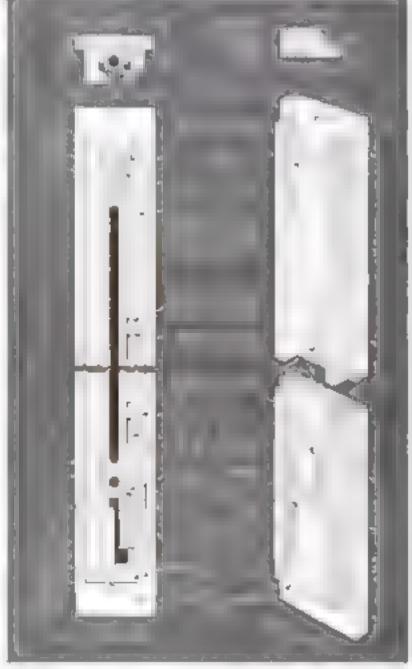
Since the height of the mercury column varies with the air pressure, and storms usually follow the movement of low-pressure centers across the country it is evident that a barometer is essential to your back-yard weather station, and the mercury type, being so simple in construction, is a first-rate project for your bome shop Obviously, you must add to the tube and dish a rigid support of some kind equipped with guards to prevent breakage of the glass, but the labor of making it is almost negligible. You probably have a smooth board on hand that will furnish all the needed lumber

At a drug store purchase a round glass bottle about 1 in. in diameter and 3 in high, fitted with a composition screw cap A suitable glass tube also must be obtained. One easy way to get it is to buy a gauge

glass of Mein, bore and 3 ft. in length, which is stocked by most hardware dealers. This size usually sells for about 90 cents. Regular barometer tubing with one end closed can also be bought from dealers in scientific supplies. Mercury costs about \$1.50 a pound, and 21/2 lbs. will be required for this tube. If you can obtain a glass with an inside diameter of 1/2 in., only 9 os. will be needed and other sizes, of course will be in proportion

A suitable back is suggested in the drawings on this page. The guard





How to mount a mercury barotneter [1 consists mercly of a glass tube and a small bottle or cretern set up on a board with a scale that can be adjusted to show the height of the mercury

## Barometer

#### WEATHER BUREAU

can be worked out, but in spite of all possible care hundreds of tany hubbles remain scattered through the column. In the course of time some of these bubbles may work to the top and spoil the vacuum.

Fortunately, the filling can be done without much trouble. If you find it manady to do the job at home, you can probably get permission to work in your local high-school laboratory. First the tabe must be scaled at one end. Warm it for some distance back from the end. moving it back and forth in the flame and rotating it with the fingers. Then concentrate on the very end, continuing to turn the tube until the glass softens. The closing can be specified by pushing the glass many with an item rod. Continue heating until the glass runs together in a smooth blob.

No matter how clean the tube appears to be inside, it must be considered dirty. To clean it, make a solution of I part nitric acid to 20 parts water, and nearly ful the tube with it. Cork with a rubber stopper and shake for a minute or so; then empty, rinse with tap water, rinse again with dutified water, and stand aside to drain for a quarter of an hour. Now fill the tube with strong alcohol and pour out, repeating eight or ten times, to remove the water, and drain for at least half an

hour. The tube is then ready for use. For best results, however, the bottle should be treated the same way

As there is some danger of spilling the mercury, it is a good idea to do the pouring over a large crock or enameled kettle. Warm the tube and a quantity of quicksilver, and, using a funnel, pour in enough to fill the glass 3 or 4 in, deep. Holding the tube lightly in the fingers, heat it gently in a Bunsen flame, turning and moving it up and down to prevent ex-



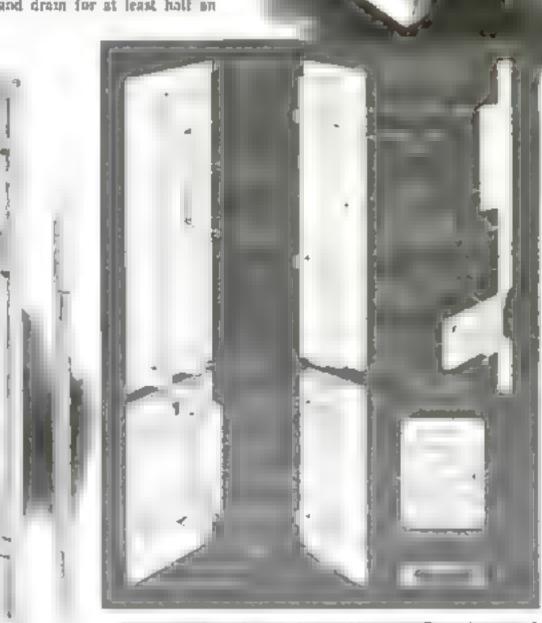
Here is a more elaborate barometer than the con shown on the facing page. It has an indicator at the top with a slow-motion screw, the parts being illustrated at the left

cessive local heating. As
the temperature of the
mercury nears the boiling point, air and moisture
are driven out and form
tiny silvery-white bubbles,
which coat the interior of
the tube and give it a frosted appearance. These bubbles enlarge, but ofter the
mercury boils for a while
they disappear entirely.
Forther bouling takes place
with sharp clicks as the
metal spashes about an in-

dication that it has continued long enough Now add a fresh quantity of warmed mercury and repeat. You can easily see the line of separation between the treated mercury and the new. Continue the process until the tube is nearly filled. The last 2 or 3 in of the tube are then filled without boiling

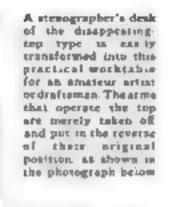
It is not possible, of course, to use the thumb to stop the tube, as the cistern opening is far too narrow. However, a cisk of waxed cardboard makes a good substitute. Holding the tube vertically in the crock, lay the disk over the end and clamp it there by turning the cistern bottle upside down over it. Thus scaled, the tube and bottle can be turned right-end up. Still holding the two firmly together, pour a lattle mercury into the cistern—enough to fill it about 1/2 in. deep.

At this juncture the assembly should be fixed to the supporting back, which of course must be held firmly upright. Lift tube and bottle together and set them on the shelf between the guards. Stip a strip of soft leather between the tube and each clamp, fold the ends over in front, and screw on the tin strips, leaving them loose enough to allow the tube to be moved. Cautiously raise the tube 1/2 in, to let the mercury assume its level, and tighten the clamps. Keep a (Continued on page 104)



A suggestion for making the improved barometer The scale is moved up and down by a slow-motion screw at the bottom, then the indicator at the top is adjusted with extreme accuracy as in the upper photo

Studio Worktable



A STUDIO worktable sooner or fater becomes a necessary part of the equipment of every amateur artist or draftsman. An excellent substitute for high-priced professional worktables can be made from a second-hand disappearing-top stenographer a desk.

The disappearing top A is first removed and all metal beneath it detached from the body of the desk. The metal arms B, C, D, E, and P are then merely reversed. It may also be necessary to cut them down, if too long. They are then acrewed and riveted as follows: Arm B is acrewed into the disappearing top at J, then attached to arm C with a screw at Z, and both are attached to the desk body. A thin metal washer should be placed be-

tween the desk body and the joint connection of arms B and C so that they may swing easily when the worktable is in use.

Arm C is next connected to arm D with a rivet at S, arm D is similarly riveted to arm B at 4, and arm E acrewed into the

side of the desk at 5 with a metal washer. The same operation is now performed on the other side of the desk. When completed, the top A should swing easily and close without slipping. Screw 6 is a stop joint to hold arms C and D from swinging back too far. Its position depends upon whatever angle is preferred for the slanting top. To open the desk, press down the operating mechanism at point P as if it were a pedal.

F as if it were a pedal.

A bole may be bored in the right-hand side of the worktable for the ink bottle, if ink is used. There is then no danger of upsetting the bottle.

The small tray at the right-hand side of the worktable is made from a 3% by 12 by 18 in oak board. It may be attached with a binge or an ordinary clothes-closet swinging arm.—Joseph Creaker.

#### SHOE TONGUE CAN'T SLIP

If YOU have difficulty in keeping the tongues of your shoes from side-slipping, you can stop this annoyance by punching two holes, as a hown, in the longue at the point where the laces cross between the



upper holes. String the laces through these holes, which will be hidden by the

bow -- GEORGE W. KINDER,

#### Combination Couch and Bed Made From an Old Davenport

MODERN studio couch that will open into a comfortable bed for two people can be made from an old duofoid devenport, three boards, and any autable covering material. You can obtain an old devenport at almost any used-furniture store. Select one, if possible, of spring construction set in a wood frame. Remove the ends, the back, and all the old imitation leather on the seat Cut a wide board—14 in is thick enough, or you can use old table-top boards—threach end of the devenport, so that it will be even with the front and top of the seat

Use the old davenport end as a pattern for marking the bolt holes in the new end. This will insure the davenport's unfolding

properly when finished.

Now notch the rear top corners of the davenport ends to receive a board 1½ in. thick and approximately 4 in wide. This is to be used instead of the old back. It covers an empty space there, hesps to brace the ends, and provides a place for a spring latch to hold the seat in its folded position.

Now re-cover the seat. Cover all the way to the bottom on the front; also cover the ends and the backboard with the same material. Take pains to do this evenly and neatly.—Clipper A. Long.



# JUDGES NAMED for GUILD CRAFTWORK CONTEST

RUFUS C. DAWES, LORADO TAFT, and TONY WONS among men who will select winners of trophies and \$2,000





ITH this simple glass-cutting ig. you can remove the tops from bottles in order to make vases, flowerpots, chemical flasks, and any number of other containers.

The wooden base D as 8 by 15 in. On it are mounted two uprights A and C. 14 by 3½ by 6 in., which form a cradle The back stop B in 14 by 4½ by 6 in. The small blocks attached to these three parts are about 2½ by 3½ in. Upright A and backstop B are adjustable by means of

holts fitted in slots cut in the baseboard.

Slots are provided in A and C to receive a three-cornered file, and A is also drilled at the angle illustrated in another of the photographs to take either a file or a glass cutter

A hightweight bottle can be cut merely by rotating it in the cradle in contact with a file that has been broken off short to provide a sharp edge. For glass tubing place the uprights close together and use the ble lying across them. After this treatment

bottles having thin side walts will anapaper cleanly and evenly with a light tap.

Rather than chance breaking beaver bottles or small square bottles with thick corners, wrap them twice with soft string at the file mark and soak the string with a few drops of alcohol. Light the string and, when the alcohol has burned away, quickly remove the string and slowly lower the bottle, mouth up, in a container of cold water. It will separate into two parts with an audible snap.—Kenneth Muraay

#### SMÄLL BLOWPIPE MÄDE FROM OILCAN

A BLOWFIFE is essential in chemical analysis and in testing minerals for fusibility and other reactions. An efficient one can be made from a small five-cent ofican.



a length of rubber tubing, and a valve stem from an old inner tube. Select an oilcan which has a spout with a very small round hole. In one side of the oil reser-

> voir drill a small hole and solder a section of the valve stem over it to form a connection for the rubber tubing.

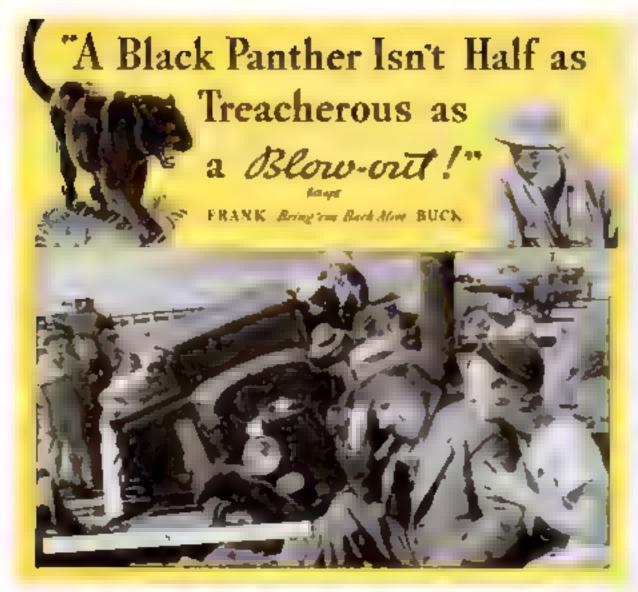
The reservoir of the can focus a receptacle for collectme the condensed moisture from the breath, as in the better commercial blowpopes. In addition, the operator's face need not be held near the burner and no heat from the flame can be accidentally conducted to the lips.—L. C. Perrier,



### NEAT WAY TO INCLOSE STAMPS WITH LETTER

WHEN inclosing slamps in an envelope, you may attach them safely and neatly to your letter by the method illustrated above. This prevents any possibility of the stamps being cost or removed by some unauthorized person without the knowledge of the recipient.—W. E. LECOUNT

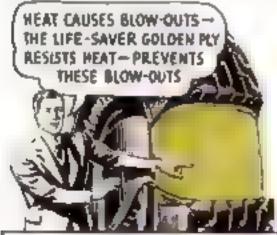




### New kind of tire protects you from dangerous, high-speed blow-outs

'D RATHER try to 'bring back alive' a rouring tion than bring myself safely through another blow-out accident," says FRANK BUCK. "When that ties blew out—when my car plunged off the road at those rocks-there was nothing I could do to avoid the crash. When I take my family or friends out for a ride I want to be sure to 'bring 'em back alive.' So now I m playing safe by riding on Goodrich Silvertowos."

When a mun like Frank Buck says a blow-out is more dangerous than capturing wild animals, don't you want to do all



FREE Handstone emblem with real most re-flectable protects but if your at light goes out Sec. Your Gride of dealer on Schottown Salety League, ger one FREE Cresed the Cacourt pack na 60 ma na Dept. 451 Theil: F Goodrico Con Akron. Ch.



you can to avoid having one yourself? Can you afford to risk your life with these high-speed blow-outs, when Goodrich Safety Silvertowns cost no more than other standard tires? Get a set of Silvertowns oow. You'll get real blow-out protection and months of extra mileage FREE.

#### How blow-outs happen

When you drive forty, fifty, thuty miles an hour, terrific heat is generated duide the tire. This heat causes rubber and fabric to separate—causes blusters to form—blusters that grow bigger and bigger until suddealy BANG! Your nire blows out, You can't steer. Anything might happen.

But in Selventowns the pubber and febric don't separate, for the Golden Ply invennon resorts internal hear. Blisters don't form. And these high-speed blow-ours are prevented before they get started,

#### More miles . . . safer miles!

Ask your Goodrich dealer to show you these new Silvertowns, Press your hand on the deep-grooved tread. Feel the big, hosky Silvertown cleats grip, Then you'll know why they also give you maximum protection against dangerous, "tast-spin" skids. Nonce the paggedness of this extendick Silvertown tread that gives months of extra mileage-at no extra cost.

Don't drive around on dynamice-put Golden Ply Silvertowns on all four wheels, They cost oo more than other standard tires.

Copyright, 1935, The B. F. Goodrich Co.

#### CHECK UP YOUR CLUTCH TO KEEP IT EFFICIENT

(Continued from page 56)

slipped, it couldn't take bold.

Have you ever driven a car that wouldn't start up without almost jerking your head loose? That's because the clutch takes bold too suddenly. The adjustment may be too light, the clutch surfaces may be glazed over or the rivets that hold them in place may be sticking out so that they grab."

"Gosh, iso't there some way to take up for the wear in a clutch without taking it all apart?" asked the car owner as he gazed at the assortment of parts on the bench.

"SURE. On most clutches you can adjust the pedal to make up for normal wear and tear, but your clutch is beyond that. The only thing left how is to put on new friction

"Clutches are fuzzy things. The more they slip, the more they wear. From the looks of yours, it's been slipping a long time If you'd had it adjusted four or five months ago, this might not have happened"

But how in the world would I know it

wasn't working right?"

Gus shrugged has shoulders. "You can't tell how much air is in a tire by looking at it but you can have it checked at your garage, now and then. Bendes, if you know where to look for them, you can find plenty of symptoms of a slipping clutch.

It generally shows up first in starting, the motor will race, but the car won't move shead very fast. Then, sometimes, on hile, the engine will suddenly speed up without making the car go any faster

"You can tell a lot, too, by the feel of the church pedal. If you find it doesn't take hold 'till it's almost all the way out, it's

usually a sign something's wrong, "Nones are another warning. When a clutch chatters, chances are the pressure plats is warped or one of the springs is weakening. A squeaking dutch, generally, comes from tack of oil in the throwout bearing, and a rattle means one of the moving parts is loose or a spring in broken

'Of course," communed Gus, working as he A shipping clutch doesn't asways mean wear or broken parts. Sometimes oil or greate gets on the cratch facings and makes it slip. When that happens, the best cure is a gasoline bath. Turn the motor over slowly and squart the gas over the disk with a gresse gun or an old garden spray"

"But I thought some clutches were sup-

posed to run in oil."

"Some are, but the majority of modern cars use clutches which have to be dry, to work. Except for a few that have more than one friction disk, most clutches are just like

"Gosh I" The car owner wagged his head, "This clutch business is all news to me I never gave it a thought until today,"

"AND that's where most of the trouble comes to," pointed out Gus. "A clutch, to most drivers, is just something you have to fool with every time you shift gears. Most cutch troubles don't come from normal ear; they come from abuse."
"By the way," the man said when Gus

announced that the job was finished, "you haven't upped me off to any tricks I can use to save my clutch."

"Forget about the tricks, and use a little common sense," advised Gus, "Just keep your foot off the dutch pedal as much as possible. Don't give the car too exach gas when you re starting up. Don't slip the clutch to hold your cut when you're stopped on a full. And let your service man look at the dutch now and then. If a slipping dutch is caught to time, it can be adjusted in a  $\mu H y^{-n}$ 

Goodrich Sofety Silvertown &

## Souvenir Coins

form Novel

BRACELET

A chance to try your hand at simple jewelry work and learn the useful art of silver soldering

By W. T. BAXTER

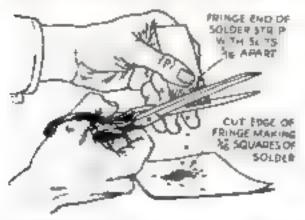
Bin Aliver coins or medals, a largeth of Me. 20 ollver were and aliver notice are the materials used for this bracelet

SOUVENIR coin bracelets form novel and decorative gifts. All that is necessary to make one are aix silver coins or medals about the size of a dime, 2 ft of No. 20 round silver wire, and a piece of silver solder.

Wrap two thicknesses of newspaper around a small nath. Hold the nail with pliers or in a vise and wrap the wire around it lightly, making about twenty-four turns. Place the nail over a flame until the paper burns, thus allowing the coult alip off easily. With a pair of end nippers, but the coil into rings, and use a thin fit to make the out smooth.

By the same process, prepare the connecting links, but use a flat piece of metal about 3 .6 in. wide and 1/16 m. thick as a form. Cut this coil into links through the curves

Lay out the coins or medals in order. The bracelet shown is made of four coins and two George Washington medals. Place them one at a time upon a charcoal block and silver so der the rings on the edges of the coins, as follows: Place joint of ring against coin. The ring will fit better if it is filed flat at point of contact. Cover joint with thin paste of borax and water. With alcohol blowtorch, or blowpipe and



How silver solder is cut into very small bits.

Hunsen burner, heat rhargoal around ring until moisture in borax is evaporated. With toothpick or small tweezers, place a tiny piece of silver solder in borax solution to clean; then put it on joint to be soldered. Apply flame gently until moisture is evaporated, then heat rapidly until both com and ring are red bot, at which time solder will flow

Silver solder will not bridge a gap easily, so the ring must touch the coin.

After each ring is soldered to a coin the joint must be covered with a thin paste of yellow other (a powder) and water or jewelers' rouge and water, which protects it when the coin is heated again.

The links that hold the come together are next put in place and hard soldered. A convenient way to hold the come is to

As Left: Colling Sciver were around mandrain that have been wrapped in paper. The paper in later burned and the colle cut into the because read to the colle



Two coins set in slot in black preparatory to soldering lask

cut a slot in one side of the charcoal block and force the two comes into it, allowing the link to fall upon the block.

When the coins are linked together, add hoks at each end until the bracelet is of the required length.

To clean off the melted borax, put the bracelet in diluted sulphuric and—about filteen parts water and one part acid—and leave until Continued on page 101)

### HOW TO DO MODERN

# Stereoscopic Photography



Walter E. Burton

By

MAGINE that you are a grant with eyes spaced 20 ft. apart. You could then look at a building 1,000 ft, away and see it stand out solidly in a star thing plastic form. Of course, you cannot actually rack your eyes out 10 ft. on either side of your nose, but you can employ a single-lensed camera for photographing the building from two points 20 ft. spart. look through a atereoscope at the prints and see the building as a giant would see at

A generation or so ago every livingroom table was graced by the family stereoscope, a two-lensed device through which the beauties of Niagara Falls, Chinese temples, and ladies' boudoirs were revealed in three dimensions. The stereoscope in an improved form was revived at the Chcago Century of Progress Exposition lastyear, and enjoyed considerable popularity

Pictures or stereographs intended for viewing through stereoscopes are made with a camera having matched lenses in twin shutters, spaced about 2) in, apart. Later, the images are transposed and printed as positives, the transposition being necessary because a camera image is Inverted. But such twin-lensed cameras do not tap the real wonders of threedimensional photography because their lenses are separated the same distance as the human eyes; and the human eyes do not see etereoscopically at distances much grenter than 100 ft, or closer ioches.

When aerial maps are being made, the camera carried by the plane makes exposures at intervals so arranged that consecutive prints overlap more than half Any two of these prints will, when viewed through a stereoscope, reveal details in all three dimensions. The buildings of a city thus seen look like tiny, perfect models.

The base line—that is, the line running from one eye point to snother-can be increased much farther than these limits

in certain cases. Astronomers can photograph a beavenly body just after nightful. and again just before dawn, and get a pair of pictures with a base line about the same as the diameter of the earth, or they can make the pictures half a year apart and obtain a base line running between opposite points of the earth's orbit

In the same way pigmy vision produces things as they would appear if you were the size of a bee, a guat, or even a microbe. This is accomplished by making two photographs from points separated only a fraction of an inch, even down to a distance measured in thousandths of an inch, in the case of stereoscopic photomicrographs.

Thus, by making a picture of a tiny iqsect and then moving the camera of In-(Continued on page 88)



of the plersoscope At right Attaching the small missors to p'ywood muunte with toundhead ecrews The projecting heads hold down the glass







To look at a attreograph without a stereoscope (he observer must move his eyes apart as if he were looking at a distant object, and then bring the pictures in focus without converging the eyen again. Thus is not a difficult trick. A wedge-shaped prittes aids in obtaining this effect

# Make this snapshot at home Tonight

#### HERE'S ALL YOU HAVE TO DO

Use Kodak "SS" Film. Set your camera for 1/25 second—open the lens to f.6.3. Put 1 Mazda Photo-flood bulb in lump A—2 in lamp B. Distances as indicated. Sight the subject, chick the shutter—and you've made the picture.



Ind Yal in the transfer

HOW MANY WONDERFUL PICTURES you've missed because it was dark outside. Now you can get the many things that make evenings so enjoyable—you can take snapshots indoors, at NIGHT.

Just use any camera with an f.6.3 (or faster) lens, loaded with Kodak Super Sensitive Panchromatic Film. This high-speed "SS" Film is three times as fast as Verichrome, six times as fast as ordinary film, under artificial light. Two or three Mazda Photoflood bulbs give ample light.

Hold the camera in your hands as you would outdoors, set it for 1/25 second, open the lens to f.6.3. Sight the subject, click the shutter, You've made a snapshot, Indoors... at NIGHT. It's as easy as that.

ALL YOU NEED FOR SNAPSHOTS AT NIGHT



ROBAK "\$\$"—the Enteringefeet film with the preen lightning Bushes on the familiar prilon but the film that induces seemet in any light loss pareon picture quality.



MAZDA PROTOFLOOD SULES give brilliant light . . . last for about I we hours, counts for many pictures. Cost but 25r.



RODAFLECTOR— Incupendite officient, , , makes 1 Photofined but be do the work of 5. Complete with stand, cofecture and part, \$5.



Kodaks. With f \$ 3 Kodaks. With f \$ 3 Kodaks. The constitution from the comput observed forms for characters believe for characters believe forms and wide-angle forms may be used. Crownd-glass forwing, they cut film, film packs or player. Ideal for supposters at right. For 21, 234 leach pictures. 4th.

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Here's a bank you'll want in your library. Lamplete details about indoor picture with Photofood and Photofook bulks. Tells you how to make outdoor night pictures of lightning, lighted buildings, lireworks. How to make mosalight photos. Write to Eastman Rodak Lampany, Ruchester, N. Y.

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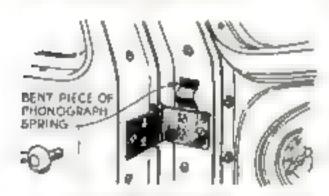
## Useful Kinks for Motorists

These Suggestions, Contributed by Our Readers, May Save You Time and Money in the Operation of Your Car

ASILY made snap-on signs will convert any sedan into a trim delivery wagon in less than five minutes. The signs, made to fit over the side windows and doors, can be painted on imitation leather or linoleum. Button fasteners fitted to the car body and the four corners of each sign provide the means of holding the signs in place. When the car is desired for pleasure purposes, the signs can be removed easily.—H. M.

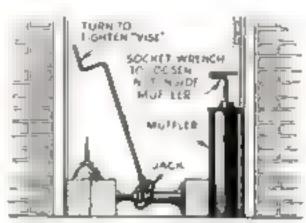
### Ends Rattling of Doors

AFTER being annoyed for several months by a rattling door on my coupe I decided something had to be done When regular commercial anti-rattlers failed I tried a little experimenting on my own. By bending how-shaped a short length of spring steel taken from the motor of an old wind-up phonograph, and fastening it between the door hinge and the jamb. I clammated be noise entirely. The spring asts longer than the usual rubber anti-rattler device,—J. W. C.



A piece of apring steel from the motor of a phonograph stops a door rattle effectively

With a pair of next sign to cover the rear doors an windows, any pivesure camay be used for delivery purposes. The signs core, off easily when not in use



### Improvised Vise

Will.E working on the exhaust system of my car recently. I found that I needed a large vise to bold the muffler while I loosened the nut that held the exhaust pipe. Lacking a vise I bit on the idea of making use of my jack. Placing the muffler against a door frame, I fitted the jack in between the muffler and the opposite jamb, padding each end with a wood block. A few turns of the handle lengthened the jack enough to hold the muffler firmly in place. The same idea can be applied to many other jobs around a car or in the home workshop where a large vise is needed for a job that a small one cannot bandle.—(Miss) M D M

### Handy Half Curtains for a Roadster

FOR the roadster owner who is continually getting caught in heavy downpours when his side curtains are stowed away the homemade half curtains a astrated hi a long felt need. The only tools needed are scissors and an ordinary sewing ma-



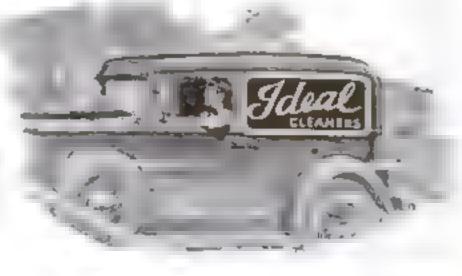
A pair of half curtains like these, easily made from light conver, are bandy to have along when caught in a sudden rain

chine and the materia's consist of about a vard of fourteen-ounce canvas snaps for the door fastenings and dot fasteness for the windshield supports. Get the artisal dimensions from your own car. Then cut the curtains to the shape shown

allowing sufficient excess on all three sides for folding over and stitching. The butloos and stups should be placed to agree with those on the car—C H D

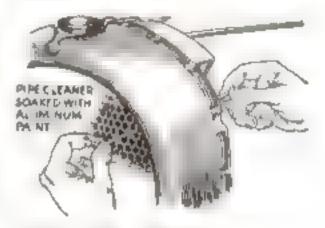
### Touch-up Paint

IN TOUCHING up worn spots in body and fender innishes, apply the paint with a small brush and thin the fat outer edge with a circular motion of the thumb. This eliminates any everlapping effect—R. S.



### To Stop Radiator Leaks

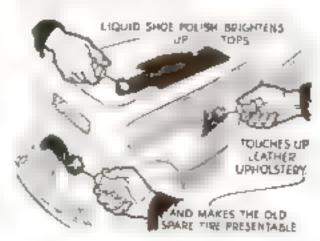
EAKY radiators are a common trouble with most cars that have seen several years of hard service. Atthough several good remedies are available on the market, a can of ordinary aluminum paint provides a theaper and equally efficient cure. First locate the leak and mark it plainly with a piece of chalk. Then drain the radiator, and apply the aluminum paint to the leaky section with a pipe cleaner drawing it back and forth through the honeycomb hole or holes until a good layer of paint is deposited. Allow at least an hour for the paint to harden before refiring the radiator.



Aluminum paint appired with a pipe closurer, stops a radiator leak at practically the cost

### Brightens Spare Tires

OLD SPARE TIRES as well as car tops can be made presentable by applying ordinary black liquid shoe polish with a brush or dauber. Incidentally a bottle of shoe dye or pulsah also is a handy thing to have around when repairing leather upholstery; it will color worn spots and cover stains.—R. L. S.



## SCIENCE INSURES

# Ford Accuracy

PISTON PINS MAY BE LITTLE THINGS — BUT LOOK HOW THEY'RE INSPECTED

Modern science plays an important part in these ingenious automatic machines built by the Ford Motor Company to inspect piston pins. Radio principles are employed and a photo-electric cell or electric eye indicates the hardness.

The machine checks every piston pin for smoothness, hardness, straightness, roundness and diame-



ter. One machine can check over 1500 pins an hour and those not up to the high Ford standard are automatically rejected.

First the pins are forced through a unit that wipes the surface clean. Then they slide under a needle on a pick-up head. Ma-

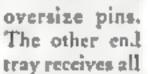
croscopic variations in surface finish set up vibrations which are amplified by a two-stage radio amplifier, and unless the pin is absolutely smooth the machine rejects it.

Next an automatic scheroscope checks the hardness. A light beam passes through an opening at the correct scale reading onto a photo-electric cell. The scheroscope hammer is released, strikes the pin, and rebounds to indicate hardness. If the pin has the right hardness the hammer rebounds and intercepts the light beam for a sufficient interval. This sets the mechanism to okeh the pin. If pin is not hard enough the hammer does not rebound high enough to intercept the beam; if the pin is too hard the hammer goes past the opening. In both cases the mechanism rejects the pin.

The next two units of this machine inspect for straightness and roundness. A variation of only one ten-thousandth of an inch—1/30th the thickness of the average human hair—throws the pin out. That's accuracy for you!

The last unit measures the diameter and sorts

the pins according to size. Pins distributed in the three center trays have passed inspection and are graded by one ten-thousandth of an inch. The tray on one end receives all





When such machines are used for the inspection of parts there can be no compromise with accuracy. This is just one example of the painstaking efforts of the Ford Motor Company to make sure that Ford parts are right. It is one reason why it is possible to maintain such high standards of quality in Ford cars and yet sell them at such low prices. It is also a reason why Genuine Ford Parts are the best parts you can use in your Ford car or truck.





FORD MOTOR COMPANY, DEARBORN, MICHIGAN

### "that's the Color Scheme we want"



Now you don't have to guess what your house or any room in it is going to look like after all the colors have been applied. Before a single drop of paint goes on, you can see the full effect that will be produced when the job is finished.

Simply go to your dealer in Lowe Brothers products and tell him you want to look at the Lowe Brothers "Pictorial Color Chart." He'll show you full color illustrations of various types of houses and every kind of room—all painted with actual paint.

You can see exactly how one color "goes" with another. Instead of merely hoping that everything will turn out all right, you can assure yourself of complete estisfaction.

But, above all, don't make the mustake of using inferior paint. Analysis shows that many "chesp" peints contain as much as 63% water and other evenorating liquids. Lowe Brothers paints are 90% film-forming solids that remain on the surface. Lowe Brothers paints cost much less in the end.

Ask your dealer to show you the Lowe Brothers "Pictorial Color Chart" today The Lowe Brothers Company, Dayton, O.



PAINTS • VARNISHES

QUALITY UNSURPASSED SINCE 1069



DONALD W. CLARK designs a new simplified model of a



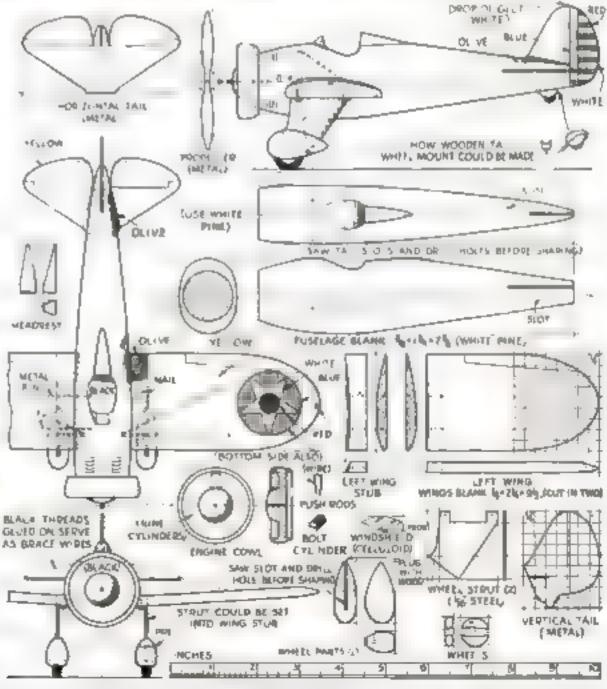
### Fast Army Pursuit Plane

SE of the world's fastest high-altitude combat planes is the trim little Bocang P-26 A. It is an all-metal, low-aing monoplane built especially for the United States Army. A supercharged 600-m. Waspenging drives it at a speed of more than 200 miles an hour. The span of this fast ship is only 22 ft.

This simplified model is built on a scale of 14 in. equals 1 ft. of the real surplane. Only seventeen parts are required, not counting the engine cylinders, which are short sections of bolts cemented to the recess in the rowling as shown. The push roch may be made of wire, set into the crankcase and cemented to the cylinders. With sharp tools and a little patience, the cowling may be shaped by hand from balan or whate pine if a lathe is not available.

It is best to fit the wing stubs to the fusclage before sawing them off the wings, as it is then causer to hold them. The holes for the wing pine also should be drused before rutting off the stubs so that the wings will fit exactly

A coat of flat white paint will serve as a filter and form a good base for the other cul-



Top front and side views of the new Boring pursuit plane and detects of the futelage, engine cowi, wings, wing stubs, tail usine, wheels and "pants," wheel struts, propeller, and other parts

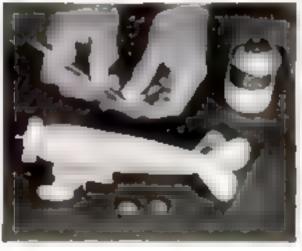


The wing pine should be best alightly upward to give the notessary dihedral on the wings

ors, but use a good grade of point Some model makers prefer to apply a cost of clear natrate "dope" for this purpose. Mark the insernia and other details with a hard lead pencil before painting. The colors are finelage, wing stubs, wheel struts and wheel "pasts." olive, wings, horizontal tail, and vertical fin, yellow, engine, tires, and tries, black, propener and wheel disks, aluminum, insignia, red, white, and blue Black writing ink may be used to get the dult effect of tires, cockpat opening, and receives in the cowling.



Real at a six the model of white finished, it requires only these asymptote a mp's parts



Oluing the headrest to the fusalage. The wheels also are attached with glue or cement

### HOW TO TEST THREADING QUALITY OF PIPE

Too often the selection of pipe for a given service fails to take into account its threading characteristics. However, if the threading equipment is in reasonably good condition, the problem of poor threads usually can be traced back to the material. It is an excelent precustion to test all pipe, the quality of which has not been well established. The simplest and most effective test may be made with tatric acid after filing and cleaning a bright apot on the pipe

The application of nitric acid will leave a dark spot on steel pipe. The darker the spot, the harder will be the steel and the more difficult to thread. The bright spot on wrought-iron pipe will remain bright after being touched with nitric acid, in most cases, when threads are persistently leaky and it is difficult to find the source of the trouble, the acid test will clear it up.—Harry Karrestan

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### "It's safe enough in here, mister! but it's poison in your engine"

"I'm talking about the dirt and grit and fine metal particles and hard carbon that always find their way into the crankcase

"This Purolator has protected the oil stream . . . kept it clean and effective for better than 8,000 miles of driving. Now, it is full of this deadly sludge it has filtered out of the crankcase oil. You must renew it. Let us put on another cylinder, containing a clean, fresh, GENUINE Purolator Filter element. Then your oil will stay clean for another 8,000 miles."

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every part of the engine... where they score cylinder walls... break down valves... wear out bearings ... send many a car to the junk heap, long before its time.

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NO MATTER how much or little time you have for your home workshop aclivities, it pays to concentrate your efforts on worth-while projects. To help you do this, we offer a series of bluepeints for models. furniture, radio sets, toys, and other projects The following list gives a wide selection, but many other prints are available. Send a stamped and addressed envelope for a comparte lot

Our blueprints are mich 15 by 22 in and cost 25 cents a sheet (except in a few special cases). Order by number The numbers are given in italic type and follow the titles. When two or more numbers fallow one tale it means that there are two or more biseptints in the complete set. If the letter "R" follows a pumber, it indicates that the biseprint or set of blueprints in accompanied by photographically illustrated testructions which supplement the drawings. If you do not wish this supplement, omit the letter "R" from your order and deduct 25 cents from the price given. Instructions alone are 25 rents each

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Popular Science Monthly 381 Fourth Avenue, New York Send me the bluepriot, or blueprints, numbered arm inclinance dynamic OWNER 4000 City and State Please print your name and midress clearly

# Old-Bill SAYS:

WHEN horing heavy work of seregular shape in the lathe, it pays to spend sufficient time to balance the faceplate properly. The concentricity of the bore depends on this precaution.

Forget averything but your machine while at work. That will disa help the other fellow to do the tame. Carelessness and inaltertion are what coust most thup accidents.

Madern lapping compaunds cut quicker than the accepte for many fitting jobs

It is every mechanic's duty to study the amount of shrinkage on a piece of tool steel so as not to make the mistake of allowing too much stock for grinding previous to heat treating. The question of warping thould also by taken into consideration.

A defection cam an a punch press can quickly "wing" an aspension punch-and-disjob.

A toolmaker who takes peide in being accurate, keeps his square in a special case and has it tested at least once a year.

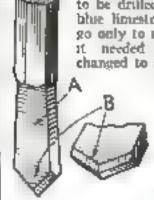
When using a hardened mundrel or arbor on the lathe for shoulder work where extreme accuracy is necessary and where the arbor is reversed to maintain a given width, it is important to eliminate any variation due to the wear of the center. This can be done by using a ball-bearing live center.

A hardness depth of from \$940 to \$550 incan be had on mild stret by carbonizing reheating, and cyaniding. This method will give the parts a clean gray finish.

When filing aluminum, apply a little parafin to the file.

If a grinding wheel appears too softincrease its speed if it appears too hard decrease it. This cute is applicable to small chaps with fewited equipment.

### FLAT DRILL CUTS HOLES IN VERY HARD STONE



Receives a number of holes had to be drilled by hand in very hard blue limestone. A star drill would go only to a depth of \$6 in before it needed redressing. We then changed to a drill forged as shown in the shape of an old.

in the shape of an old fashioned flat or "farmer's" drill, but used like a star drill. The results were surprisingly good. This type of drill will work equally well in softer substances.—F. W.

# THE REFRIGERATOR MECHANISM

that defies time



#### Look to the Mechanism !

The General Electric mechanism is entirely scaled in steel, protected against air, dust and moistage. It requires no attention not even othog, and operates so quietly you can scarcely hear it. General Electric gives you is year performance protection for only \$1.0 year.

### G-E is the only refrigerator with forced oil lubrication and cooling

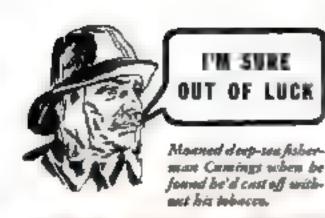
Circulates 3 quarts of oil per minute through the mechanism , maintains 6 to 8 pounds pressure on all bearing surfaces.

THE PERFORMANCE of the sample, flawless refrigerator mechanism developed by General Electric has amazed tiwher everywhere, its incomparable care-free, attached to be seen at entire some feet service year at entire goes beyond the expectate of even the post of the state.

Modern convenience features will of course, be found in all G E refr gera as but the reportant consilerant in but the region of the consilerant, and placed the emphasis where it belongs won dependable by long life, and low operating cost.

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REY! ANY
YOU FELLOWS
GOT A
PIPEFUL OF
TOBACCO?



"SURE," SAID ONE, AND PULLED CLOSE TO TOSS HIS TIN



IT WAS HIS OLD FRIEND, THE BLUE TIN OF TOCKWORTH IT

YOU can bet Mr. Camings was glad? For the next hour he knew he denjoy the wild pipe tobaccu that has a rich tobacco flavor—the flavor he and millions of other true pipe smokers love. Try this long-burning, mild and fragrant tobacco in year pipe. Buy Edgeworth today! Only 15t, Larus & Bro. Co., Richmond, Virginia. Tobaccontest since 1877. Here's Mr. Camings' letter:



Paper Veneer Covers Costly Looking

## FIRESIDE SCREEN

The is reasonably durable when mounted and sheliacked, and to the unintuated the finished niay tunnot be told from the conventional wood type. The fireads street (finished lovered with it.

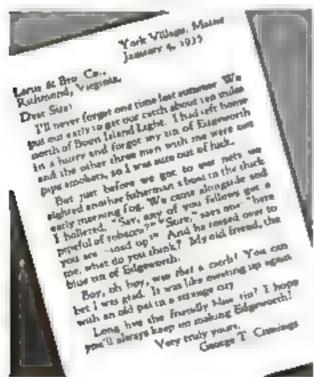
The paper can be obtained in art stores and from dealers. That used by the author cost 20 cents a sheet, 20 by 50 in. The only tools necessary are a custom board, straightedge ungle-edged rasor blade, small glue brush, and a bottle of liquid glue

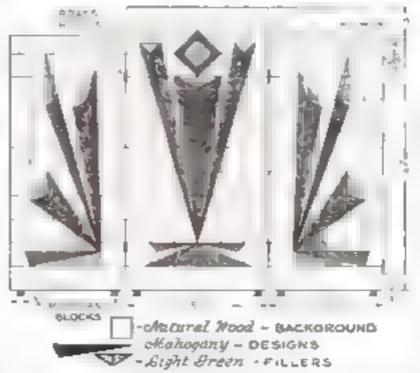
The acreen is made of ½-us, plywood as shown in the drawing. The back is incquered green, and the edges painted gold or silver

In this case the veneer-paper design is mahogany with green fillers, and the background, which is applied last, consuts of natural wood squares with their grain run alternately at right angles. The squares are 2½ by 2½ in except along the upper and outer edges of the wing pieces, where they are slightly smaller Any design may, of course, be used.

First mark the design on the plywood. Next, select the desired color and mark the correct shape of each piece on the sheet with a very

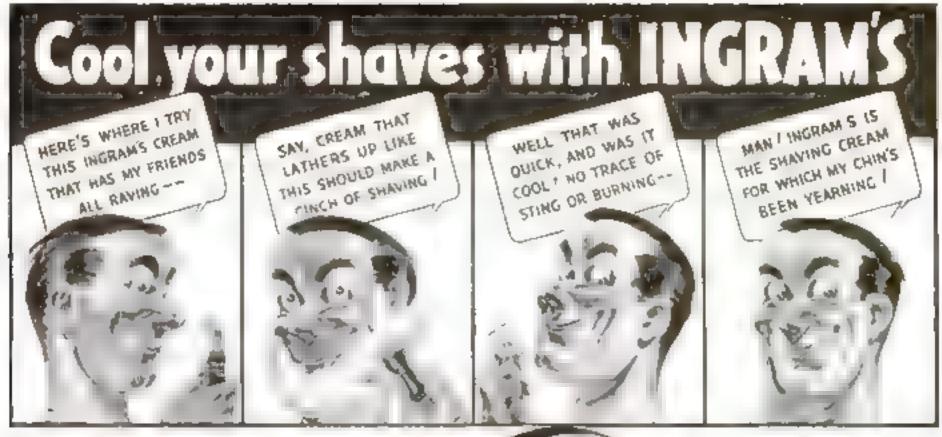






sharp pencil. Do not try to cut out all the ports and then put them together, but do one at a time and fit the next or adjoining part to that already mounted. Give the completed screen several coats of shellar put on with a spray gun, if available. Be sure the surfaces are laid flat to avoid any running of the color, Sand lightly between coats.

Standard colors that may be obtained are green, red, gray, light green, yellow, and natural. Other colors may be made by staming the natural as desired. Card-table tops, all types of screens, beds, paceled furniture, and even the interior walls and doors of a bouse offer excellent subjects.— Leslie M. Holskook.



HERE S a tip from a motion happy sharers: If you want your shares cool as well as close, the latter -

lagram's blaving Greum softens who kers until there's not a spark of spank left in the n. Just prey for your rasor. No need to pray for your face

It's cool while you're shaving, and after. In the speed after are three special ingreduces that souther the skin and tone it. No aftersting, no call for become

Ingram's SHAVING CREAM





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### Auto Racing Improves Passenger Cars

I wround from page . )

speed, and an the racing drivers used garome from that particular well. Tetraethyl lead made its appearance in 1924, and, since then, read-reated gasoline has been used by the winner of every Indianapolis race, and every other Important race. From the speedways and the dirt tracks its use has spread to the motoring public

Even a slight locreme in the efficiency of an automobile part at sustained high operating speeds becomes a great improvement under the much less trying conditions of ordinary business or pleasure driving. If an improved part shows an locrease in efficiency of even one percent at 110 miles per hour, its efficiency will be increased forty or fifty percent at normal driving speeds.

In the early years of racing, even the best can broke down in more races than they finished. But every breakdown taught the engineers and manufacturers a lesson, and many of those mishaps resulted in advances in the efficiency of the production automobile.

Twenty-five years ago many serious motoring accidents were caused by broken steering knuckles. The same failure caused smashups on race courses. Experience gained in racing showed that steering knockles broke because they had become crystallized by the vibrations set up at high speed. Changes were made in design and materials, and now a broken steering knuckle is hardly ever heard of in either racing or ordinary driving.

STEERING wheels used to break. Bob Burman, attempting a sharp turn at high speed in one of the old road races, pulled the wood run of his steering wheel right off the spider. Bob crashed, but ever since then, steering-wheel runs have been made to that they can't come off, no matter how hard you treat them.

Frames used to buckle and axles used to break under racing stresses. We should thank the race drivers for the sturdy frames and safe axles of today's cars

Early automobile springs were modeled after the springs of horse-drawn vehicles. Those long, curved springs were all right for slow road driving, but they were much too resilient for racing. So the race drivers used to tape them to take out some of the bounce, and from this practice developed the shorter, flatter, and more efficient springs of to-day

Shock absorbers were first used on racing cum. So were magnetos. And so were superchargers, which recently have been adapted to a few manager cars.

Only a few years ago, cleaning spark pluts was a once-a-week job for careful motorists. Racing experience led to the development of the modern plugs that demand practically no attention.

Another of the lessons that automobile manufacturers learned from racing is that pressure babrication of every single engine bearing is necessary. And in the design of bearings, racing practice—the use of thin babbitt and the steel-backed bearing—has been incorporated in standard production.

In the early days of racing, it was the duty of the mechanic riding with the driver to lean far out from the side of a racer rounding a curve to keep the car from turning over As speed increased, this job became too much for the mechanics, and designers began to pay more attention to balance. When Ray Hartoun, himself an able engineer, won the first

Indianapolis "500" in 1912, the ability of his Marzoon Wasp to hold the turns easily at seventy-five zones an hour attracted the attention of all automobile designers. They found that proper weight charibut on was the secret of that ability, and as a result achieved a degree of balance in passenger cars that makes it possible for the ordinary motorist to drive his car around turns at brisk road speed without even a thought of turning over

Of ITE as important as the problem of proper car balance was the problem of balance in rotating parts. Racing drivers spend many bours delicately balancing their wheels with small lead washers, because a deviation from balance of one outce in an automobile wheel running at 100 miles as hour exerts a centrifugal force of 500 pounds, which is sufficient to lift the wheel and axie from the track when the heavy side comes up. Imagine the effect of even a slight tack of balance in a translabilit turning 6,000 revolutions per minute! The development of perfectly balanced translabilits, which avert the vibration that used to wreck vital engine parts, is the direct result of racing experience

Automobiles used to be much more expensive than they are now One reason was that they had to use cognes of large capacity and slow speed, engines that ranged from 300 to 200 cubic inches piston displacement and made about 1,000 revolutions a minute. These big, heavy engines were difficult to balance, and care had a dangerous habit of getting out of control when the roads were the least bit slippery. It was obvious that if the automobile was to (Continued on page 112)



... BUILD THEM IN YOUR OWN WORKSHOP

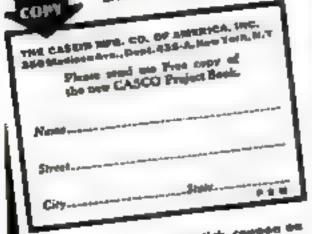
Recently the manufacturers of CASCO Waterproof Glas rande cash awards to the 28 housecredumen who submitted the best woodworking projects built with CASCO Glos during 1934.

Now these print graning or. ticles have been collected in the form of a most interesting and instructive book which contains actual photographs and descripslows of these outstanding woodworking projects...inlaid card and game table, model hollow bull sail bost, unique tilt rabin made from cigar host wood, modern beverage set, beautifully patterned wood turned vases,

tempe, smoking sen, cigapette boxes - and many others ranging from dalicate wood jewilry to portable camp refrigurators.

The object of this book is to guide the homecrafter in the utilization of inexpensive pieces of wood end veneer, to build with the help of CASCO Gine, beautiful and durable atticles of perpanent value.

This fine book cests you nothing. Send for your FREE copy now-theen's a real treat in store for your.



GET OUR NEW LOW-PRICED KIT FOR A MODEL OF

H.M.S. Bounty



KIT O. An II in model of the S. S. St. Louis

Three famous abips. The two small once are to one but

XIT Z-Madel of H. M.S. Bounty

HE mutury on the Soundy took place a century and a half ago, but the shap as probably more famous today than she ever was. For that reason she has been selected as the Popular Science Model-of-the-Month Club project for April. She makes one

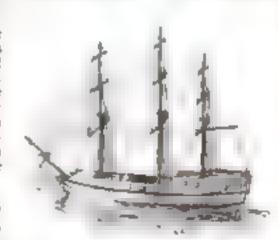
of the most beautiful small ship models in the entire series and is well worth building enturely usade from the romantic glamour that surrounds her history

A complete construction kit for building this new miniature model of the Bounty has been prepared especially for Model-of-the

Month Club members The price is \$1.50, post paid anywhere in the united States. Readers who are not members of the club may obtain the kit for the same price while the supply lasts, and they will find in each kit an application card for joining the club, if they wish to avail themselves of the opportunity.

The kit contains a soft pine bull block carefully cut to the correct profiles. all necessary wood, rig ging cord, fiber, were beads, glue, finishes, and miscellaneous materials,

and a full-more blueprent. The finoshed model has a bull 814 in long, is 1134 in long over



# Atfantee

KIT U-Hispaniols of "Treasure Is and"

all, and stands 814 in high. The hull block is designed for making the complete hall, but if you prefer a water-line model, like all previous models in the Model-of-the Month Club series, the block may be cut off on the water line, thus reducing the height of the model to

in. The scale of the model in relation to the full-stee ship is 1/12 in

equals 1 ft The new kit is marked

Z in the following list. which gives all our construction kits. Those listed as "standard ship model lots" are for our larger and more elaborate models ali of which were deagned by Capt E. Armitage McCann. He also built the new Bounty model, it being one of the few measure models be has made. That in liself la enough to guarantee its beauty, accuracy, and authenticity

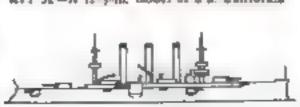


RIT X-A 121 y-in, model of \$ \$. Calcforness

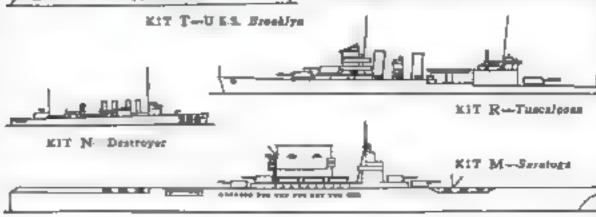
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EE. Same with hall lifts sawed .. 745\* G. Elizabethan galleon Revenge, 23-m. 6.75° O.O. Same with bull blocks shaped... 7 25\* L. Farment's flagship Hartford, a sceamand-sail sleep-of-war, 33 G-rg. boil.

LL. Same with hall lifts sawed. 8 454 Q. Privateer Spailow 17-6-m. holl with



Here is a remarkable fleet of outstanding American fighting ships, all built to the scale of 1 in equals 30 It. The model of the aircraft carrier Saratoga is 18 in long



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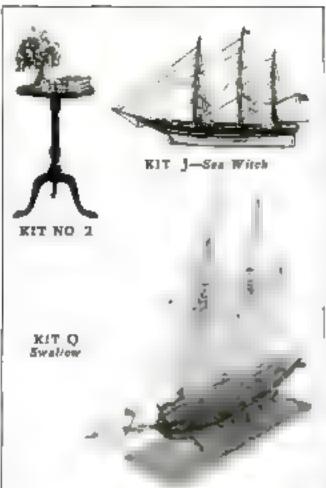
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### HE FELT LIKE A TRAMP

### when he tried to get by without shaving!

Somerimen patches of stubble on the face can be an embarrassing an patches in the pants. If you don't believe this, just think back over your own experience, or ask your friends about it. Do you remember that time you thought you'd get by without shaving—then met someone very important? Didn't you feel like a tramp—untily and slovenly?

It pays to look your best at all times—to use a blade that shaves you close and clean without discomfort. That is why the Gillette "Bue Bade" is first choice of the overwhelming majority of men. It is an amazingly keen blade—especially made to shave tender faces easily. With it you can shave every day or twice a day and never experience rasor smart or irritation. The Gillette

"Blue Blade" is made of the finest steel obtainable any where in the world. Fed through automatically controded electric furnaces—developed by 6 liette metallargists—this steel is tempered to exactly the correct degree of hardness. Grinding, houng and stropping operations are automatic, held to unbelievably close standards of accuracy. In fact, no expense is spared to make this the smoothest-shaving blade ever produced.

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FREE Write The A. S. Boyle Co., Department PS-4. 1934 Dana Ave., Critin nati. Ohio for interesting booklet 1200 Things to do with Plastic Wood."

STIC: WOO

GRACEFUL

# Garden Ghair

### BUILT FROM SCRAP LUMBER

### By Herman Hjorth

THEN the weather begins to get warmer and the days become longer, it is pleas ant to sit in the garden, provided one has a comfortable seal. The garden chast shown in the accompanying drawings meets the easen tial requirements and is designed to withstand dampness and rain. It calls for less material, is lighter and

more graceful, and can be moved about easier than the common Cape Cod chair Odds and ends left over from other jobs may be used, and as it is to be painted, several kinds of wood may be combined. The main emential is that the seat supports and the two front legs should be made of fairly strong, strughtgrained lumber, free from knots or other defects.

The two sest supports are laid out according to the pattern, sawed to shape, and smoothed. The slats for the seat are then nailed or atrewed in place. Two bardwood wheels are boited to the ends forming the rear segs. These, however, are optional and may be omitted.

The pieces for the back are then cut and fastened together in the same manner. The lower ends of the uprights rest on the seat supports and fit in between the hat two stats. The pieces forming the front less are bolted to the upper end of the uprights.



The chair is now put together and adjusted so that the front of the seat is 16 in. above the floor, and the front and rear legs 151/2 in. apart (outside measurements) Nail the front legs temporarily to the seat supports and plane the ends of the back until it fits on top of the seat supports. Then festen these parts permanently with dowels as shown.

The arms are each made of two pieces, glued and doweled as indicated in the detail. Use only waterproof casem glue.

After a final sanding, the their is painted with a good grade of outside paint of the desired color. He sure that every part of the chair is well covered to prevent rotting. After the first coat (the priming coat) has dried, all holes in the surface should be filled with a good crack filler or putty. The surface is then sanded with No. 2/0 sandpaper. Two or three additional coats of paint will be necessary

The garden chair may be made more comfortable by covering seal and back with detactable turbions. These may easily be made by stitching two layers of an old quit together and covering them, preferably with

waterproof material,

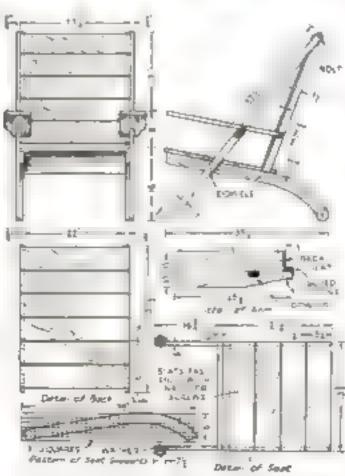
### List of Materials

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	4.		3	21 0
Wheets	1,		2	7 ,
4 Carriage bolts	1427			

are undefined stars

### CLEANING LACOUER

STAINS cannot be removed from lacquered pieces with alcohol because of its effect on the finish. When water alone will not remove the stain, try carbon tetrachloride. This liquid will not barm the finest lacquer finish, and can be used freely in cleaning articles such as typewriters, beverage trays, and objects of celluloid. Don't use it on varnish, however.- K. M



Front and side views of the chair details of the back, seat, and arms, and pattern of seat supports

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yet we said—and repeet-"If NOT MORE THAN SATISFAC-TORY, your money returned immediately."

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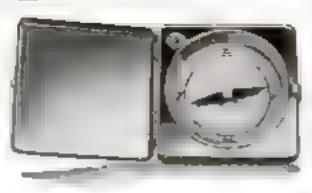
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### POCKET COMPASS FITTED INTO OLD COMPACT

ANY how can easily make a next, good-looking pocket compan to carry on trips in unfamiliar country or for use in electrical experiments. The chief requirement is a lady's discarded compact. The dial, needle, and bearing can be taken from an inexpenave commercial computs, or made by the foundated method

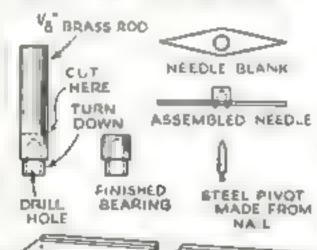
Draw the dial on white paper or cardboard and glue it to the bottom of the compact. For the needle, use steel from the comparatively soft back of an old tubing saw brade or flewble-back back saw. First drift a hole for the bearing, then file and grand the needle to shape. The bearing on which it awings is made from a piece of 14-in, bram rod. A hole for the pivot is first drilled in the end of the bearing, after which it is turned or fired as shown and riveted to the needle. The pivot is made from a brad filed In a point and riveted to the bottom of the

The needle is now magnetized by drawing it several times across a magnet, Locate its north pole, punt it red, and set the needle

on the prvot.

The top of the compass consists of a circular disk of transparent celluloid held in a benel made of a strip of lead, 16 in. wide and 1/10 in thick. A groove for the disk is cut in the lead near its edge with a sharp knife drawn along a ruler. It is then wrapped around the disk and pressed into the com-

Compacts differ so much that no dimensions can be given for the duk, needle, and length of bezel, but the same method will serve in all cases. Dien He remisson



BEZEL MADE FROM VIB SHEET LEAD WITH Y-GROOVE TO HOLD CELLULOID CRYSTAL

How the compant accide and besel are well

#### FLUX FOR SOLDERING

OrderARY gine-cut acid, used as a soldering flux, will usually corrode delicate metal surfaces on which it is used. In such cases use I on of nine chloride, chemically pure, dissolved in 3 as, of water. This does not contain as much free acid as does the ordinary ther, but retains all of its advantages for soldering.—G. S. G.



to There will fee a speeder soft! Plate to the second and the second sec

### Assemble Your Ki-Yak in 9 HOURS!

Mend a NEW construction principle enables was to assemble "LE" Eportetion 4. It has in TWO-THIELS LESS time. Home assembly entered on the Home assembly entered plant Taken your cell the pleasure of knowing administrative process. The spirit includes ungled chargers funders, yarlita-men NUSA dime to cover bandling pactage cluster on giver are coursely practage cluster on giver are coursely through the AD Kit Yaks a nation? Send 190 more for Homes action? graphen are to those Build-er of Parts & Ropply BUNK! 20.00 declie-blade pacific now GIVEN with your cut to it Kit ar Pactory. Built Ki-Yak-of you havey!

MEAD GLIDERS " CHICAGO

### WHATEVER MINIATURE MODEL OF H. M. S. BOUNTY YOUR PROJECT

t antimited from page 591



ness are a let The liver beauti the go squal cared a from North and Meaning Toronto. bas " " wist 4 1 124 1 In all a v A not C Supt of F

NICHOLSON FILES



pages of any magazine devoted to tools and their use In the home. Take a red pencil and draw a circle around the word file every time it is mentioned. We believe you will find files mentioned more frequently than any other individual tool.

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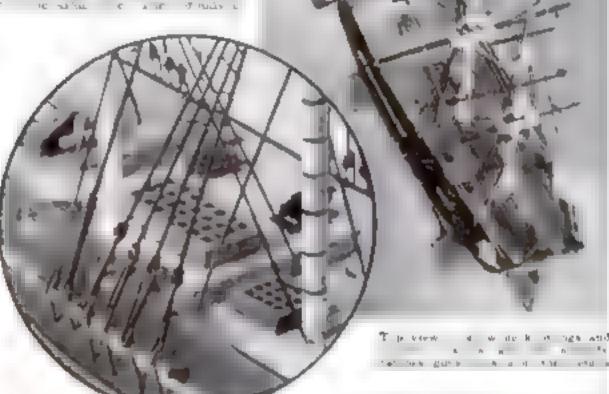
up through the top, down on the same side. through the eyes and are knotted at the height indicated. I found a risting bitch the best anot to make at the exact height

Another easier way to set up the shrouds es to bore holes in the hull point the ends of the shrourts in them, and fasten by drawing

in gloed toothpicks. In this case the deaderes are represented his heads strung on the shrouds and glued to position like the toothpack method also for fastening the main and muzzen stava and Rentinck shrouds to the deck, and the beadgest to the ball.

The forestay is double and knotted under the bowspirit. The fore-topmast stay is also double knotted similarly, then twisted, carried down to form the bobstay, and tied to a hole in the stem. The other two stays go through the pb boom and through the

> How stern of the model is pronuented. The windows can be cut right out if desired and transparent wropping tastened behind



intohin steker and back to the half just back of the catheads. The doiphis striker is a broken needle with a large eye, the end being thrust in a hole in the bowspert cap or bowspert.

The yards are fastened to the masts with a loop of thin were, which searts abail the mast. The ends are carried around the yard on either side, and then twinted together back of the mast again

The royal and Louisnuck on page 85)





STERN TAFFRAIL AND WINDOWS



QUARTER BADGES







surface, an inferior palar will leave ridges. Avoid this like Kyanize Lustaquik, the self smoothing ename). Ridges and brush marks serually smooth themselves. It dries quickly in only 4 hours. Comes in sustren colors — all attractive shades.

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M. CAN LUSTACUIT

Both for





### MODEL OF THE BOUNTY

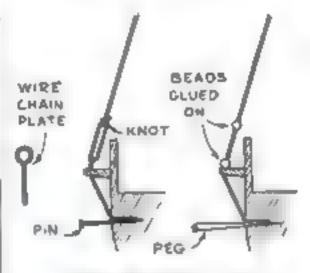
(Continued from page 84)

topeallant lifts and beaces are each in one piece, with a half-bitch at the emisthead and another at the yardarm. They are then carried back to the next mast and there knotted together. The lift part should be blackened A touch of thin give at all knots enables one to cut the ends off close

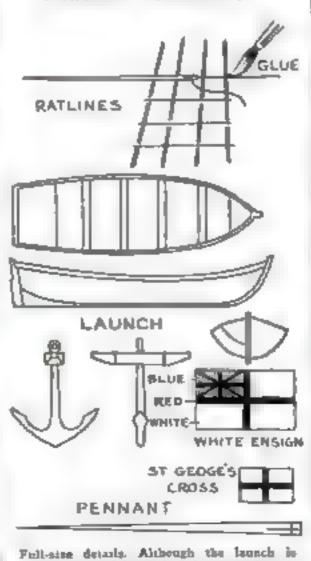
The topsail and lower sits (of methum cord are separate, and the braces go through blocks or beads at the yardares. Those of the main are tied to holes in the bulwarks. All the missen braces, of course, should lead [orward]

The topenest shrouds I put on in the oldfashioned way, with Bentinck shrouds to hold the ends. Make a (Continued on page 10)

FORE MIZZEM CHANNELS CHANNELS - FULL SIZE



TWO METHODS OF FINISHING SHROUDS



shows, the model will look better without it.

# er power, easy starting, flosby performance. It's the talk of the industry — the world's smallest, all-purpose, full-power twin, 30 quality features AND Johnson's famons Balanced Construction! SEEN YOU

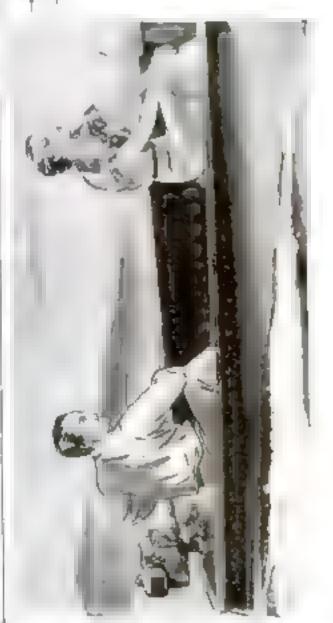
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ECIZSE OUTBOARD MOTORS ing with advanced features of acronautical design—new compactaces, casier poetability, great outboard motor



(Bostrated Randy SOUNDON MOTOR COMPAN. 12. See PERSHING ROAD, WALKERAN, 12. prest motors in the 1935 Sca-Borrelines Chart which fi Aerw-Built 300





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### An Oilstone

would have sold for its weight in gold

AGES ago, Empress Shotoka tried and drive the evil apirate out of Japan. She ordered wood carvers to engrave enough wooden blocks to print 1,000,000 charms. Each block contained 74 intricate obstacters. How many blocks were tuined by evil specify in dull knows history does not say.

The eshione quarties of Notton-Pike were first used 1044 years later. Electric furnace estatemer were first known in the latter part of the 19th century. Modern andustry uses them to-

### take the evil spirits out of cutting tools

For hand-work and machine work, steel edges are made keener, harder and langer-lasting by editerating. Go to your bardware store and see the various Norton-Pike editemen, fast-causing, medium and extra hard.

The expert's skilful technique of sharpening blades, bits, augers, drills, etc., is clearly described and pictured in our free booklet, "How to Sharpen". Seed for is reday—before you forget!

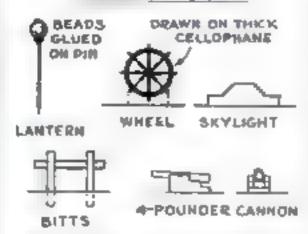


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Please read at to Sharpen aloca is a FRE	e the Norton Pike book "How I'm 1949 equals to ask for it, E
Nome on an an	
Alten	
My dealer is	

#### MODEL OF THE BOUNTY

(Continued from page 85)



Pull-size drawings of the wheel, skylight four-pounder guns, batts, and two lanterns

bowhise in the end of a piece of cord. Hold it is indicated in a drawing on page 58 and, pag the end to the deck. Then hitch a piece of this line to the bowhise, recve it through the top, over the crosstreet, down the other side, and through the eye of the other Bentinck shroud. Continue back up and so on until there are three a side. The topmast shrouds may have ratines if desired. Topicallant shrouds may be omitted. I put them in and merely knotted the ends under the crosstrees.

The anchors are most easily made by cutting them out of scraps of sheet lead, with wooden stocks. The stocks are shaped, then split in two and glued on the shanks. The rings are fied with a cord through a hole in the cathead, and the arms are bashed to the forward chain plate. Heavy coeds are carried from the rings and have their ends glued in the hawse pipes.

The flags can be painted on tracing caper. Those at the masthcads are glord to the potes and the ensign to a signal halyard from the gaff end. They are the British whote ensign, the St. George's cross, which is ted on white and a long permant, half of which is blue and the remainder tout to be point red.

The famous launch in which Capt Bligh made the forty- (Continued on Juge 87)

### List of Materials

Hall—135 x 2 x 735 white pine or balls. Filtings—Scraps of penihard wood such as gamwood as follows: 1/16 x 36 x 63a for beel 1/16 x 34 x 136 for steepost and rodder; 1/16 by 1 by 136 for steepost and rodder; 1/16 by 1 by 136 for steepost and rodder; 1/16 by 1 by 136 for steepost and rodder; 1/16 by 1 by 136 for steepost and rodder; 1/16 by 1 by 136 for steepost 2 x 3 x 2 x 1 for catheads—16 x 1 16 x 4 for betts 3 3 x 2 x 3 x 1 y for gun tarrances—3 37 x 2 x 3 16, preferably that scan mg spline—or mobilings.

Meta-Alements: Cardinard "1, a 514 for bulwarks stern etc. pies. "large brads, and 7 small brads for jancerus. "5 dameter a "5 dowel and 5 doctors applicators for spare celluloid or aber 1 6 x 1 ½ a 1 ¾ for tops, caps, etc., abert lead ¾ x 1 ½ fine anchors, ½ in, long pites glos, black, white, tan, and enpper paint, variable.

Rigging—12 ft. heavy black cord about as thick as No. 22 were and 18 ft. medium black cord about as thick as No. 30 were for 30 ft. of black cord between these two in thickness). 5 ft. medium white or brown cord, 6 ft. thin black mercerized sewing cotton (No. 70). 6 ft. thin where or brown mercerized sewing cotton (No. 70). 6 ft. thin where or brown mercerized sewing cotton (No. 70). 6 ft. of No. 20 brass wire for champlates of wire chain plates are used as in. of No. 20 copper wire for partels, etc. 14 small beads for blocks. 65 beads for deaderes if bead deadeyes are used.

Bare - 4 x 2 x 21, hardwood and 1 dowel 3 .6 diameter x 9 .

Vary Dimensions are given in inches curept where otherwise noted

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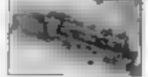
provided of the second pull independent of the con
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### Make Glazed Garden Pottery

Make becautiful subserted floundate tripings perfectly be expected throughoute triping a using the models generally to the form of the for

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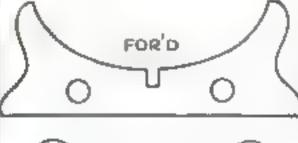
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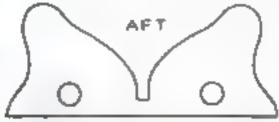
#### MODEL OF THE BOUNTY

(Continued from page 56

three day voyage is so large that I did not put one on my model. However, I give at lines for those who wish to make it. It would rest in the waist and occupy most of it. On the other side there should be a cutter somewhat aimour but smader

There is not space to describe here the fitting of every detail, but I think that this is sufficient to enable you to make a shipshape little model of H. M. S. Boanty





The thepre parts of the stand. These are joined with two I to to, downers, 41, in, long

### FASTENING SCREW HOOKS IN PLASTER WALL

Wiff his desired to drive a screw book into a plastered will and it cannot be set into a wooden stud or beam, the following method will insure its surfity. Get a two-hole ron mending peats about 1, by 2 to Serew the book into the wall brough one

had the steast

Metal plate sup-

ports screw hook

hole and then, with the plate vertical, fasten the plate with a wood screw through the other hole, which should be above the hook Both screw and hook should be firmly set in laths. The plate supports the shank of the hook and prevents its being pulled down and out

This method was used in one case for hunging up a vacuum clemer to an unused corner. A stout series eye was set

into the front of the bandle a few inches from the lower end. When the cleaner is bung up, the bandle is in the same relative position with the machine as when it is depressed to its lowest position to get under furniture. The hook in the wall is placed at such a height that the machine will just clear the floor when in place, thus eliminating unnecessary lifting.—Arraus L. Fond.

### THIN VENEERS GLUED WITHOUT CLAMPING

By a street method that is practically unknown among amateur mechanics, thun wood veneers may be applied without a press or the use of heavy tlamps, It is intended, of course, for relatively small work, overlays, and the like, rather than veneering large panels. The veneer is first cut in the exact sizes to be used and the backs are given an even coating of a good grade of liquid glue. When this is dry and everything is in readiness, the glue surface is moistened with a wad of cotton and, when it becomes tacky, is presed in firm contact with the wood to be covered. Place a sheet of brown paper over the veneer and press it with a hot flatiron until perfeetly amouth.-E. L. Rossexs.



RIGHT, men. No innocent little blaze could produce fumes as overpowering as that stewy pipe and villainous tobacco.

Some men are like that they smoke too-strong tobacco in a never-cleaned pipe until they haven't a friend left. Fortunately, the number of Sir Walter Raleigh fans grows by the hours men who keep their briars tidy; men who prefer this mild blend of Kentucky Burleys that is calm on the tongue, tempting to the nose. There's a tin kept fresh for you in heavy gold foil at your dealer's. Try it—and Sir Walter will have another triend!

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### TRAINS DAYRUMY HAIR

-to stay put!

### Costs but a few cents to use a bottle lasts for months

IS YOUR HAIR difficult to keep in place? Does it lack natural gloss and

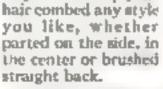
It is very easy to give your hair that rich, glossy and orderly appearance so essential to well-groomed boys. Just ruh a little Glostora through your hair once or twice a week-or after shainpooing, and your hair will then stay, each day, just as you comb it

Glostora softens the hair and makes it pliable. Then, even stubborn hair will stay in place of its own accord.

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A large bottle of Glostora costa hut a trifle at any drug store and will last for months.



### MODERN STEREOSCOPIC PHOTOGRAPHY

Continued from page 701

another exposure, you can learn how the insect might look to a midget whose eyes are on 1/2 in centers. When viewed through the stereoscope, the insect appears to be many times its normal size. If you photograph the room of a doll house on a base line of about 14 in , the room will appear normal size when seen through a stereoscope.

Stereoscopic illustrations probably will be used more widely in textbooks and other pubficutions than at present, because they convev so much more information than the ordinary picture. In fact, an automobile manufacturer recently usued a catalogue contain mg several stereoscope illustrations of curs. chases, engine, and mechanical parts. The pictures, printed in two colors, are viewed through two-color spectacles that repder the resulting plastic picture in black and white

No phase of photography offers more thrills to the amateur than that of three-dimensional recture making. As long as you limit your efforts to things that do not move, you can employ any camera that produces fairly sharp

pactures.

happene you want to photograph a house an three dimensions. Samply shall a pacture of t then step a few inches to the right or belt and map another. When the prints are made, place them side by side and view them through a stereoscope

"How far shall I move for each exposure?"

That depends on the actual distance of the object from the camera and the distance you want it to appear to be when you look at the picture. You can employ a simple for mula to figure out the proper reparation of viewpoints. Here it is

mbere I

he distance in school the lametatens must be moved between ex-

had a discount the object from the amera to ret-3 A governé distance so lect a su mané. the otiect to be when I in look through he stereous que

The actor terters to be normal separation of human eyes, in inches.]

St PPOSE you are 100 ft. from a statue and want it to appear only 2 ft. away when you look at its picture through the stereoscope. The separation of the camera lens in notes equals 21/2 times 100 divided by 2,

If you want to see an object in its nor mal perspective, the separation should be 2%, an or the normal sparing of the ever-

If you cannot conveniently obtain a stereoscope—and there are many varieties in exestence-you can make an efficient nurror type instrument for a few cents. This stereoscope in, in principle, exactly the same as the costly instruments used in military work and other aenal surveying operations. No expenave leaves are required and the instrument

to easy for use

Two amail handbag mirrors about 2 hy 3 ir and two sarger mirrors about 6 by 9 in. are required for the framework you will need a few feet of 1 by 11/2 in, strips of white pine, sioplar, or other easily worked material, also a few wood screws and some 📞 in. plywood or similar material for supporting the mercers. The construction is shown in the iihisterations. The idea is to arrange all mirrors so that they are inclined at an angle of +5 deg to the vertical or horizonial. The two small improve are placed close together with space between them for the observer's nose and mounted with their reflecting surfaces outward and upward. The larger ones are mounted with their reflecting surfaces anward

### More Prizes Awarded For Good Photos

N THE second of our winter series of photo contests (P S. M., Dec 14 p. 78), excellent prints were submatted covering a wide variety of subjects-indoor views, landscapes, postraits, still life studies, action pictures, and various novelties. Prizes have been awarded as follows:

FIRST PRIZE \$25 Ralph H. Anderson, Yosomite Na-wonal Park, Calif. SECOND PRIZE, \$15

Samuel P. Zito, Niagara Polls, N. P. THIRD PRIZE, \$3 A. Zachary, San Francisco, Calif.

FIVE PRIZES, \$1 Each C. A. Sawyer, East Orange, N. J.; Stanicy V. Hollard, Troy, Idako; William Deppermann, Orange, N. J.; A Boroden, Monchester, Mon ; F C Heidenreich, Montepie, Calif. HONORABLE MENTION-A. S. Inderson, Stone Fulls, S Dak ; Cornella Clarke, Grinnell, Jours; Bernord B. Conheim, Chicago, Ill ; Lyle. Fowler, Brook yn, N. Y 2 Marrett Heler, Louisville, Ky.; Mac Oids Y pailenti, Mich.; Doris Samter, Et kins Porb, Pa.; Allan C Shone, Requer, Pa : H J Stephenson, Minne-apolis, Minn.; W Edward White, Plymouth, N. H.

The winners of the January Con-test will be announced next month

and downward, and their centers are in line with the centers of the sma ser marrom. The distance from the table surface to the large currors and from the large mirrors to the small ones may be about 7 in., measured hetween centers of the glass. For convenience you can fasten the parts of the frame together with bolts and wing nuts so that it can be dismartled and folded.

To use the stereoscope, place the right-hand print of the stereo pair under the right mirfor, and the left hand one under the left Move them about until their images merge to produce a plastic picture. The prints may he of any size up to about 8 by 10 in. and they need not be trimmed or mounted. Make the prints on either matte or glossy paper Extreme gloss sometimes causes troublesome reflections. When making enlargements, besuce that objects in both pictures of a pair are the same size, and that the prints are approximately the same density

The ambitious amateur photographer may pick up a few dollars by promoting some phase of stereophotography in his neighborbased. Perhaps he can persuade a real estate dealer to buy an inexpensive sterenscope, and award him the contract of making stereographs of houses that are offered for sale. A prospective customer, by glancing at a house parture through a stereoscope, can obtain an

extenent idea of how it looks

If the photographer has a twin-lens camera for snapshots of moving objects, he may be able to get numerous orders for photographing children, pets, and people in action. An inexpensive stereocamera can be made by binding together two box cameras of the same size, inverting one so that the shutter controls are on the outside, and connecting the shulter release levers together so that they both can be operated at the same instant.



Then the "trouble-shooter" on all glee problems for LePane smand he ought to know glue Born with a glue bruth in his hand, he has handled all kinds for high on stary pract.

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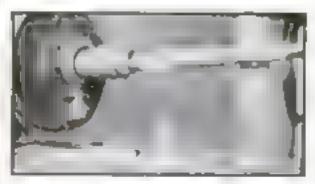
### RUBBISH BURNER ALSO HOLDS GARBAGE CAN



HIS combination garbage-can holder and rubbish burner is one that does and cats cannot upset and it has a rustic appearance that harmonies well with surrounding objects. A it 3 mixture of cement and sand was used as a binder, and the old bricks were spaced sufficiently apart in bonzontal rows to permit ventilation and prevent undur smoke when the device is used as an incinerator Note that the lower opening was formed by letting the bricks project progressively to avoid using a metal linter. A piece of scrap trott was placed arross the flue below the top to support the can at the proper height East F Moones

### TURNING AND GRINDING LARGE DRILL SHANKS

I'V THE smaller shops where the supply of drills, especially in the larger sizes from 1 to 2 in,, is limited, it is often necessary to reduce a layered shank to a smaller sure or change it to a straight shank. This can be done more quickly and easily if a combination bushing is made as shown.-- H J C



CENTERING BUSHING 52 MCHY STEEL

NOT HARDENED BORE FIT TO PLUG TURNED IN CHUCH AND DRIL CENTER A



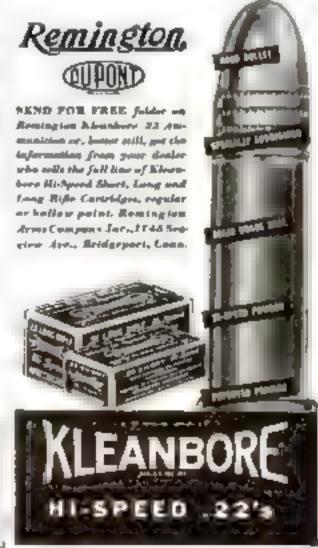
Combination banking for holding the point of a drill while turning and granding shank

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### HOME REPAIRS

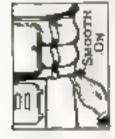
Quick, easy, dependable ways to make over 100 of the commonest emergency and voutine household repairs are explained in this free booklet.



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EVERY householder has his unlucky days, when something suddenly leaks, breaks or comes apart, but—you can laugh at many such emergencies and save much

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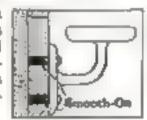


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### JUDGES NAMED FOR GUILD CONTEST

(Continued from page 67)

settlement and fater was author of The Dances

Plan in the Making

Mr Taft is a famous sculptor He designed the Columbus Memorial Fountain, Washington, D. C., the Ferguson Fountain of the Great Lakes, Chicago, the Thatcher Memorial Fountain, Denver, the Fountain of Time, Chicago, and other great monuments. He has served as a member of the National Commission of Fine Arts, Washington, D. C., and is a member of the American Academy of Arts and Letters, the National Sculpture Society, and other organizations

Tony Wors is pationally beloved for his radio broadcasts and readings from his scrap-book, and is an inveterate home worker. Dr. Bundesen also is well known throughout the country because of his radio talks. He is president of the Chirago B-rand of Health.

Edward F Worst is director of industrial arts, Chicago Board of Education. He has long been one of the leaders in the manual training field and has written many standard textbooks on industrial arts. Mr. O'Brien is an enthusiastic supporter of the home workshop movement and his repeatedly called attention to the value of this hobby in a daily column be writing for the "Chicago Daily News." Donald A. Price is one of the country's leading amateut traffsmen.

L. W Wahlstrom & another nationally known teacher of industrial arts. He was formerly president of the American Vocation-

al Association.

Thomas E. Tallmadge, F.A.J.A., is a distinguished Chicago architect who has designed many churches and other public buildting, served on numerous important art commissions, and lectured and written extensively on the betory of architecture.

Five new members have been added to the Could's pational content committee—P F Hirsch of the Newcastle (Calif.) Homeworkshop Club; H. Devere Shaw of the Bison Homeworkshop Guild, Buffalo, N. Y., Merie Hedrick of the Saginaw (Mich.) Homecraft Club; Joe Sparrow of the Flint (Mich.) Homeworkshop Club; and Wallace Scherer of the Homecraft and Modelmakers' Guild, Richmund, Va.



Toys made by the Middletown Conn ) Club

The following new clubs have been chartered Attisteory Homeworkshop Club. Hampton, Va.; Toledo Hobbynt Club Toledo Otuo Ocala Homeworkshop Club, Ocala Fla. Spokane Homeworkshop Club. Spokane. Wash., Borden Homeworkshop Cub, Horden, Ind. Kancaid Homeworkshop Cub, Kancaid, Kans. and Paradise Homeworkshop Club. Paradise. Mont.

Brekley Homecraft (Jub. Beckley W Va At the club's first annual exhibition, the Popular Science Craftwork Meda, was awarded to D. H. Harvey for a turned and inaid smoking stand an especially elaborate and beautiful piece of crafternanship A plaque by Dr. John R. Koch, president of the club, was awarded honorable mention. The plaque, which was

If You Live in Chicago, VISIT the

### GUILD EXHIBITION

RESIDENTS of Chicago and nearby communities are cordially invited to visit the first National Handicraft Exhibition of the National Homeworkshop Guild. It will be held in the Hibbard, Spencer, Bartlett & Company building, and East North Water Street, Chicago, March as to 30. Those not members of the Guild should plan to attend, if possible, on March 25, 27, 91 39. Admission will be free.

hammered from 22-gauge copper, depicts the head and shoulders of Nydia, the blind girl to "The Last Days of Pumpes." A Dutch windmill constructed by J. T. Sigler and a library table built by Rupert Shockiey also were given honorable mention by the judges

Lexington Homecrafters, Lexington, Ky The Frontier Naming Service, which operates in the mountains of mateen Kentucky, helped distribute some of the 300 toys made by this club, and much of that part of the distribution was done on horselack. Some of the toys went to the most remote places in Kentucky The Lexington churches also assisted

Madition Homerworkshop Club, Madison. When The club has been divided into two learns that compete against each other for honors in club activities. . . An extensive exhibition of the club's craftwork was shown in the annual Madison Hobby Show, A Hobby Council has been developed in Madison consisting of all the hobby clubs in the city, and the home workshop club is well represented. . . To vary the shopwork, a class in card tricks is held after each meeting by Dr. H. S. Bostock, the president of the club, who is an accomplished amateur magician.

Topcks Homeworkshop Club, Topcka, Kans. Because of the wide range of activities conducted by this club, it has been particularly furturate in the space devoted to it in the local newspapers. From time to time a



The Wood Ridge (N J ) Club gave these away

column is given to the club under the heading "Topeka Homeworkshop" by the "Topeka State Journal." A typical column starts with a calendar of club meeting dates for the month, then follow notes about various activities, usually with some reference to the national program of the Guild, and finally, a few kinks of interest to home workers. ... The jumor division conducted in cooperation with the Y M C A, is now a little more than a year old and has (Continued on page 91)



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#### JUDGES FOR CONTEST

(Continued from page 90)

40 members. Any boy under 16 is eligible to enter, and the membership is free Duanc Monigomery is the president, . . . Thirty-five dub members are curolled in the photography class conducted by Steve Smith and C. J. One of the toys constructed by the club that has been a special hit is a swinging hobbyhorse. It can be bung from a tree or a rafter. Making these horses has been a specialty of David Gray Other toys that were made in quantity by the club were ducks, peak elephants with blue ears, walking ducks, chickens that do stunts, climbing mankeys, and a variety of games. The major portson of the toys were turned over to the Shawnee County Parental Home

Wood Ridge Homeworkshop Club, Wood-Ridge, N. J Between the regular bearness meetings of the club, informal meetings are held each week at the shops of various members. It was at such meetings that the club made the toys shown in one of photographs on page 90 for distribution to needy childeen. The work was under the direction of the club's informal meeting committee, of which H. G. Hoffman was chairman. He was assisted by A. M. Romme, who supervised the point-ing and finishing. The toys consisted of boats, automobiles, arrobatic clowns, cradles, beds, battleships, high chairs, ironing boards, and

aided in the actual distribution of the toys Antiock Homeworkshop Club, Antioch, Calif. To celebrate its annual meeting, the club held a banquet. . . . In cooperation with the local Parent Teachers Association, the club gathered 100 toys and reconditioned them for distribution with Christmas food baskets.

loose-jointed dogs. Most of these were copies

of one-dollar articles found in department stores. The Men's Bible Class of Wood-Ridge

Mayravad Homecraft Club, Maywood, N J One toy made by this club proved so popular that practically everyone who saw it wanted to get one. It was a girl's sewing stand. The club constructed a number of four different toys-the sewing stand, a child's costumer, ring boards, and kiddy hories. Several members of the Maywood Parent-Teachers Amoriation assisted in outfilling the sewing stands, and that organization, in cooperation with the relief committee, supplied sames of the less fortunate children in the burough

Patchogus Model and Hobby Club, Patchogue. N. V. An exhl- (Continued on page 92)

#### ADVISORY COUNCIL

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### WHY DRAIN YOUR CRANKCASE

Have you ever wendered, when a service station man deaths several quarts of used oil out of your car, whether jan are being wuiteful? Whether you couldn't "get by" with merely adding a quart or two of fresh oil?

There are very sensible reasons why oil should be completely changed as regular intervals. Oil at work in your mores is contaminated with many things: dire and dust, fuel residues, water, and minute metal particles.

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It is also true that Quaker State has been able to climinate the "light-end" material found in ordinary oil-thus, increasing materially the efficiency of the oil. But even this advance in oil refining doesn't remove the necessity for regular crankeuse draining. You can't Afford to take chances of motor damage. Oil-rees the best all-is cheaper then machinery,

How often you should drain depends on your speed and brand of oil Some ails go to pieces under the terratic bear of your motor long before the actumulation of dirt, etc., would aversally taxte you to change. So you should drain and refill much oftener with such an oil than with a longlived oil such as Quaker State.

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#### JUDGES FOR CONTEST

(Continued from page 91

bition was recently held in 4 store window. The work included model radical trains in 0 and 00 gauge, boat models in bottles, tables, duck decays, and original paintings in oil and water colors. The duh also exhibited at the local high school during hobby week.

Manchester Hometovkshop Club, Manchester, N. H. At the organization meeting, J. men attended and listened to an address by A. J. Moran. Later another member joined, making 36 charter members in all. By the third meeting, the membershop had increased

Alliance Rometoorkshop Club, Alliance, Nebr. The first activity of the club was to stage an exhibition in a store window. A variety of projects were shown, among them a miniature castle in which a radio set had been incorporated. Woodwork, model making, decorative metal work, painting, and other varieties of craftwork were represented. By one actual count, 80 out of 120 persons who passed the store stopped and carefully examined the display. The fact that the local newspaper devoted two front-page stories to the child has also belied acquaint the madents of Alliance with the objects of the club

Butings Hometeorkinop Club, Bilance, Mont. About sixty toys made by members of the club were distributed by the Ecks Club, and many additional toys were given away by individual members of the home workshop

Beautiseth Homeworkshop Club, Brutswick, Me. The organization meeting of this club, the first to be formed in Maine, was held at the Scarles Science Building, Twenty men were present and became charter members. The second meeting was held in the manual training room of the local high is hoof.

Leanure Roser Club, Manitowor, Winc. An exhibition of work done by members was given recently in a store window to call attention of prospective members to the club is the club in the club in the club is the club in the club in the club is the club in the cl

Venocastle Homestookshop Club, Newcastle, Cald. By the second meeting, the club had grown to eighteen members. As soon as there are twenty members, an exhibition will be held and the Popular Science Craftwork Medal given as a special prize for the best piece of handicraft exhibited. Although it is one of the youngest clubs in the Guild, entires will be made in at least three divisions of the National Exhibition and Cornest

Code Homeworkshop Guid, Fort Wayne and The club has received many compliments for its work in making toys for perdy children. Although it had only a limited time in which to work, the club members took hold of the project with such enthusasm that approximately 150 toys were made and painted They were given to the City Mosson for distribution.

Tacson Homeworkshop Club, Tucson, Aria To encourage the club's membership drive. W. O. Watkins, the secretary, presented the club with a loving cup. This will go to the member who obtains the most members over a six-month period. It will become the permanent property of the member who twice gets his name engraved on it. . . . Leonard S. Raymond recently received two gavels, one being made from a piece of spruce window such and a scrap piece of Spanish mahogany the other from cocobole wood.

Atlanta Hometraft Clab, Atlanta, Ga. Plans for an exhibition in a downtown store window and a club contest for the Popular Science Craftwork Medal are being made. The club is also looking for a permanent meeting place. . . The toy-building program guined favorable publicity for the club. Forty-five toys were made and distributed through the empty stocking fund of an Atlanta newspaper.

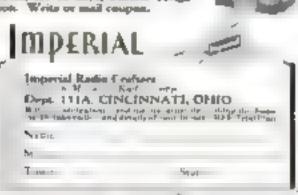
(Continued on page 11)



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Always mention Popular Science Monthly when answering advertisements in this magazine.

#### JUDGES FOR CONTEST

(Continued from page 92)

Fargo Homecraft Guld, Fargo, N. D. A. class of ten members has been organized to take an evening course in metal turning at the State Agricultural College. , , , Interest in the club's activities is so great that every meeting since its organization has been well attended. The work the club is doing was made better known in the community through an exhibition given in conjunction with a flower show held by the local garden club.

Saginaw Hamerraft Club, Saginaw, Mich. Twenty-seven entries are to be made in the National Exhibit on and Contest. The clubwas be represented in all but two divisions.

Peckskill Homework hop Conb, Peckskin, N Y The Popular Science Craftwork Medal was awarded to Rought Schoot for a canceof the kayak yee The cosh exhibition, during which the prize was awarded, was held in the window of a hardware store. Mr Schrott is planning to send his entry to the National Guild Exhibition in Chicago, About fi y projects were in the local display . . Besides building new toys of its own for distribution to needy children, the club recondi-Luned a number of toys sent to it for that

purpose by the Peckskill firemen. Hamerroft and Madelmakers' Guild, Richmond, Va. An average of five new members have joined the club at each of the last four meetings. Became of the growth in membership and the increasing activities of the club, a monthly paper is now being published, "The Chatterbort." At present it is usued in mins-cographed form, but neatly set up with two columns to the page and a decorative beading. Robert H. Athearn is the publisher of the "Chatterbox." also the editor and penner . . . Most of the 65 toys made to be given away by local chantable agencies were turned out on a production base. One member, for example, cut all the wheels for the wagons. Another cut the rockers for the ducks, another painted the heads of the horses and so Dr. A. O. James, a member of the club who was formerly to charge of dental mstruction at the Medical College of Virginia, has beloed the other members with many muta. He has adapted methods from dental practice in making models. He is also chairman of the committee arranging for the anmost ext bition at which the Popular Science Craftwork Medal will be awarded.

Snaqualmic Homeworkshop Club Snaqualmie, Wash, Much interest has been aroused by a bird house building contest sponsored by the club. The estabits were displayed in three store windows

Spokune Homeworkshop Club, Spokune, Wash. This is the second club to be organared in Spokane under the auspires of the Guild. Among the twenty members are two manual trusting instructors and one semiprofessional craftsman, C. W. Talbot, M. D., s the president

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tice has done in production fields. The Mellow Ground, \$3.50, \$3.00, \$3.40, best home shop drills are sticking to this same sound practice and that's the regson for their success; that's the reason. too, why jacoba Chucks are used us equipment on their tools. They are the evidence of the maker's desire to furnish the best.

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### INDIAN WAR DANCE SHOW

Continued from page 6 1



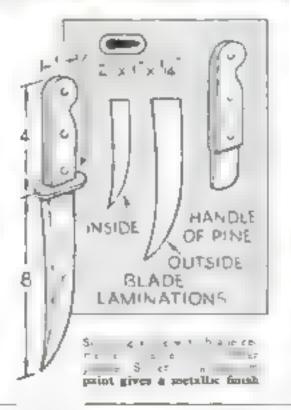
"Buchabing" made from a man's cust-off tan Pa re Beach su ! An old lelt hat forms the faundation for the costsy looking headdress

cement the tabs to the sole with robber cement. When the heel is reached, cut off any unneeded parts of the upper, and cement the sides together. Cement in the tongue, punch hotes for faces, and apply decorations with quak-drying enamel. If a thicker sole is desired a second or even third thickness may be comented in place

You wai find it a great help to wet both the rubber and the knife or scoops while Cutting:

The "cutting" edges of scalping haives Inmahawks, and spears should be immed to thin edges after the cement has dired folver or a aminum paint gives a genuine cook to these harmless weapons

Feathered headdresses are usually considered difficult or improssible to prepare by a good much in can be made from the follow ing the crown of a left hat two duzen lea hers, a sit is quick sett by cement, small pieces of teather outloth or sak ribbon a piece of bright corned flannel, some thread and a becile. Pierce the end of each qui, with a same needle. Place a light coat of cement on a quill just below the vanes and hand on a neat the bunch of adds and fuzz or down Now cut a 2 m. (Continued on page 95)



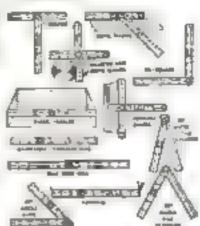


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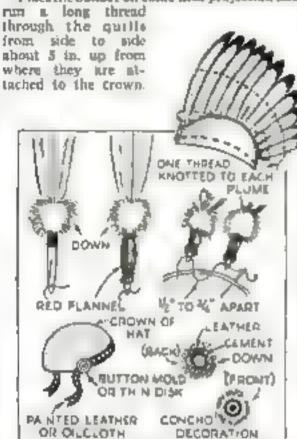
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### INDIAN WAR DANCE SHOW

(Continued from page p.j)

square from the flannel, turn in the top and hottom edges, lay on a little cement, and roll the fannel around the quill, arranging the lap to come at the back of the feather where it will be unseen in the finished bonnet Sew the quills to the hat crown 1 m. from the edge and 1 in, or less apart. Do not pull the thread too tightly. A narrow, decorated piece of leather, moer tube, oilcloth, or silk

ribbon will finish the headdress at this point Place the bonnet on some firm projection and



How the feathers are individually decorated and sawn to the crown of a discarded full has

Draw in this thread until the plumes he correctly They should fall back smoothly, be free to awing easily forward, back, and sidewise, but should not stand stiffly straight up not be separate one from another. Having settled definitely where each should lie, run th a second thread through the same boles and tie it to each plume as you go. The most striking effects are obtained with either goose or turkey feathers of pure white, the ends of which have been dipped in black dye or India drawing ink

Cast-off tan or cream-colored Palm Reach saits farmsh excellent material for backskin hunting shirts and lengings. They should, of course, he considerably oversize for the buys who are to wear the costumes.

Have the boy put on and button the troopers. Pin in the excess equally over each hipand, from hip to ankle, pin in enough material to fit the leg rather saughy. Slip off the trousers and run several lines of stitching along the lines indicated by the pins.

Put on the cost, then turn up the collar and tut it off. Bring the front together and pin to a comfortable hunting-short fit, Lenving 2 or 3 in, for a fringe, cut away the exress. Now grasp the coat by the shoulders and lift it up until the upward movement is stopped by the lower sides of the armholes Pin the excess again, running a line of pins straight out along the arms. The excess material at the back of the neck is converted into a fringe later. Take off the cost, statch along the pinned lines, cut away the excess, and slash the franges. Remove all pockets and fringe the bottom of the coal and the cutts of the sleeves, shortening as necessary

A piece of plank, roughly cut to shape, serves well as a rifle if inclused in a fringed and decorated case made of material similar to that in the suit.

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### STAMPS AND COINS UNDER THE MICROSCOPE

Continued from page 41.

all of the acid is neitralized by ammonia vapor, make the opening of the ammonia-bot-He pozzie targer than that of the acid-bottle nozzle draw out the pozzle of the acid bot the to a fine point, with an opening not much larger than a hair

I F YOU are a com collector, you will find a microscope convenient for decephering dates and other inscriptions on badly worn coirs, for identifying and comparing mint marks, for detecting irregularities that might afrect the value of the specimen, and for defermining whether the min bloom is seriett or whether there is evidence of tarassung and scentching. In extreme cases, it might even he desirable to porsh the surface of a badly worn coin, to eith it very lightly with natic acid or other standard etching solution, and then to use a nucroscope for deriphering the inscription by noting the crystalkne arrangement of the meta-

If you are not a com collector, but just a modern explorer who pokes into all manner of strange places with a microscope, you will find a com to be a more of interest. The quantity of grime an ordinary dime or quar-ter can collect in astonishing. Lurking in the corners of rused letters and numerals you generally will find an amazing amount of dust, no doubt teeming with millions of bacteria You can see how money can carry ducase

At a magnification of fifty or 100 diameters you can study the tool marks made by the engraver when he cut the die. Compare such marks on several coins of the same denommation and type, and you will find a surproving variation. Even the shapes and sizes of letters and figures vary considerably. A r up under a binocular microscope suggests a relief map of fully country. The familiar eagle's head of a half dostar becomes a mountain range, the plant below it is studded with thirteen star-shaped peaks

he you look at coin after coin, you will he struck with the fact that clinging to nearly every one, are bus of cloth fibers, crystal-tike preces of dust, and all manner of other materials. An angentious moreocopies could, by identifying such material, determine with fair accuracy something of the history of the coin's travels. A piece of money found in the pocket of a robbery suspect might reveal without a doubt that it had at one time been at the scene of the

Stamps are, if anything easier than comto inspect with a microscope, because they generally can be treated as transparent objects, a strong beam of nebt bears directed through them from the substage mitror Of course they can be examined also as obseque ol ,exts.

LOOK at the one-cent stamp you purchased with that penny, and you will and that it is not the uniform, steel-engraved picture of Yesemile Falls or Benjamin Franklin or George Washington you thought it to be Each apparently solid fine will be revealed as a series of ink splotches discoluting only the tops of the fibers that make up the paper. The power of the microscope to separate closely spaced lines which, to your eyes look solid, is strikingly shown, Increase the magnification, and you can determine the from of separate fibers in the paper perticularly along the edges, where the stamp has been torn from others like it. If you are fammar with common fibers, such as those of cotton, wood, linen and silk, you will be able to identify the material from which he paper was made. By boiling the stamp in a sodium hydravide solution, to remove the filler, you can sep- (Continued from page 97)







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### STAMPS AND COINS UNDER THE MICROSCOPE

(Continued from page of)

arate the fibers for better inspection. Because this process destroys the stamp, use a canceled one. Try the same method with aitric and instead of sodium hydroxide

To the true stamp collector, each tiny line in a stamp has a meaning. By studying such anes, he can tell much about the history of the stamp—when it was printed and what mistakes were made and corrected during the manufacture of the plate used in printing it. Aithough such details as evidence of double, triple or short transfers, recuts, cracked plates, and double impressions, frequently are centered sufficiently visible by a band lem, a microscope magnifying up to fifty diameters will be found more convenient and positive

A5 AN example of the they details for which collectors are ever on the watch, consider the 1917-19 issue of two-cent and three-cent United States stamps. On the toga draping the shoulders of the figure, near the bottom of the aval, is a but on. In some of the buttons are five vertical lines, the toos and bottoms of the first and second, and fourth and fifth lines being connected, so that the pattern looks like the numerals ore-In other buttons, the lines are not connected. On some three-cent stamps of this series the migdle line in the button consists of two short dashes with a dot between; in other buttons the middle line passes through a dot, and the two lines on either side are made up of pairs of short dashes. These they details, revealed clearly by the microscope, determine the classification of the stamp in question.

Doubtless the Ingenious stamp collector can find many other ways of totals a micro acope in his hobby. Perhaps he will find it desirable to measure the size of perforations with the aid of a micrometer eyeptece. The miscroscope may be of value in deciphering obscure cancellation marks, or its reading inscriptions under them. When highly mannified, a section of a stamp design, normally made invisible by the cancellation link, takes on an entirely different appearance. Without difficulty, the engraved pattern of the stamp can, in most cases, be distinguished from the overprinted cancellation.

On the whole, this new form of entertainment with the microscope, will provide you with many an hour of enjoyment

### METEORITES MAY COME FROM OUR SOLAR SYSTEM

Din meteorites originate with nour own solar system, or are they wanderers from outer space? New light is thrown on this controversial question by S. K. Roy, assistant curator of seedogy of the Field Museum of Natura. History He canculated the age of twenty-three meteorites,—that is, the time clapsed since they solidified—from a study of the ran active substances show commonly. None of them yielded values exceeding 3,000,000 years, which is a commonly accepted figure for the approximate age of the earth their. The new evidence thus confirms the possible withat meteorites are disin egrated particles of our own highly-organized solar system.

### CENTRAL AMERICAN PEAK VANISHES IN TEMBLOR

Curare two in a cloud of dust, a whole mountain in Hondurus disappeared during recent earthquakes. Witnesses reported that the peak, Monte Cerro Azul sank from sight with a tremendous foar heard for males.

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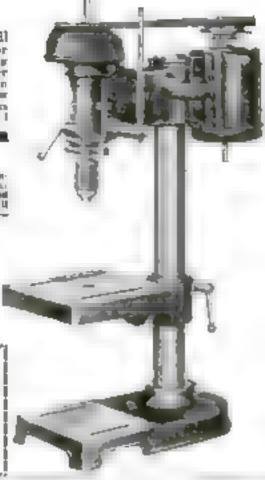
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#### CAMERAS AND DOGS

of New York to which its earner residents have clung without much change. Children, grandchildren and great-grandchildren of some of Chelsea's original tamilies still are neighbors. And as homes have passed from generation to generation, with them have been handed down antiques and priceless old furniture.

Since childhood Ruth Cushman has always loved the old things in her father's bouse and in the homes of old family friends. It was quite natural that later when she had found a mod amateur interest in photography, she should want to capture the beauty of these household treasures through the lens of her camera

Some of her pictures were only fair others surprisingly good, enough so that M is Cushman determined to go further with her hobby. In her experimentation with photographic composition she occasionally dragooned the family cat or dog as models. , , when the atimals could be induced to hold a pose long enough. And that started her toward the specialization of her hobby—animal photographs.

It was not until a few months ago, however, that Miss Cushman decided to improve her technique with professional instruction. Wanting to devote as much daylight to practical work as possible she encolled for a home study photographic course which could be followed in the evening

Part of the course taught the student to be on the lookout for new and unusual subjects, a point which is rather important in this story. It so happened that one afternoon late last Fall, Miss Cushman was sauntering along hith Avenue in front of the New York Public Library with an eye out for something to photograph when that something walked right past her-a dog. Not the type of dog that would ever be benched by any kennel club. If you tried to guess his accestry you would be as much at a loss as anyone else in designating the breed. Just a dog but with a personality that shone through a clouded past. On his back was a blanket On the blanket, an appeal from the Humane Society

Here was a subject and Ruth Cushman twing her camera into action. Interested a representative of the Society accompanying the dog, asked her to take two more negatives in special poses. Though made hastily and under adverse traffic conditions, all three prints proved exceptionally fine.

Much pleased, the Society suggested that Miss Cushman call on three of its friends—a vetermarian specializing in dog dentistry, a dog-walking service and a canine catering service. (Yes, they have them in New York and theidentally they are all doing remarkably well!) Equally





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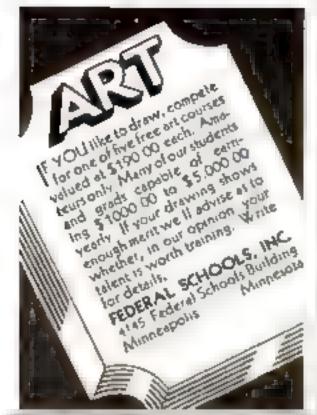


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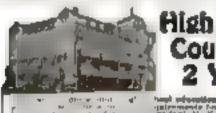
MaCarrin School of Machanical Bentrates 307 N. Broad St.

### RADIO ENGINEERING

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### Secrets of Success

as well pleased as the Humane Society, these three in turn recommended her to other new contacts.

Already a demand has been built up for and as this is written, she has been at it just four months! Unusual, yes. But there is nothing miraculous about the rapid strides Miss Cushman has made. A real interest, plus real determina iun, and interligent planning have given this girl a start. Have you these

### TAXIDERMY FOR FUN AND PROFIT

HUNTING was Carl Anderson's recreation. Whenever opportunity and North Dakota game laws permitted you'd and him in the field with a rife or shot gun. The only flow was that he couldn't preserve some of the fine specimens be

Taxidermy then was no more than just a word to Carl. He knew nothing about it not did anybody else in the neighborbood of the Anderson farm. But he could find out, and did. In one of the many magazines on the Anderson living room table, Carl found the advertisement of a home study course on mounting hirds and animals, and decided to enroll

Carl laughs now at some of his first fumbling efforts but as his skill increased with practice, friends began bringing him work. Now and then he would do an eagle, owl or prairie chicken. Occasionally he would have a coyote pekt or dog skin to be made into a rur. Once in a while the local soo had a wild animal to be preserved. For three years be plugged away at it simply as a hobby

In 1931 the State Game Department opened the season on deer along the Musouri River, taxty miles south, and hunters swarmed in from all over. Many of them came by automobile on the highway which ran post the Anderson farm and Carl, sensing the opportunity to turn his hobby into something more than just a pastime, bung out his shingle as a taxidesmist. In addition, he ran a smallnotice in the local newspaper

Within a few weeks, he had enough work to keep him busy all winter-heads to be mounted and hides to be tanned Today he has preserved fifty-five deet heads besides many smaller game and bird specimens. A recent commission was from the 200 which decided to rut down the number of African lions in its cages. Four of the animals have been made into rugs and a majestic old male has been mounted whule as a mascot for the Laons Club.

Friends often suggest that Carl move in to town but he always says "No. There is no expense here and farming, after all, is my real occupation. Together with my hobby I can make a comfortable fiving, Besides, anyone who works with taxidermy should have constant contact with nature and wild life in order to give the mounted specimens the natural expression that only close observation of the five subjects can teach."-CEP, Minot, N. D.

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#### Many Radio Exports Make \$48, \$60, \$75 a Week

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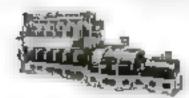
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### IF ONE DOOR IS CLOSED. TRY ANOTHER

OTTO WEIST was in a lough spot Prolonged illness, which drained his resources, coupled with the loss of his job put Otto pretty much up against it financoulty when he finally did get his health back. A good watch repairer by trade, he was able to get a little work from among his friends but it didn't amount to much. And there was no use moving to another town. He wouldn't be known and so far as watch repairing was concerned, conditions were just as bad elsewhere

But Weist hadn't made watch repairing his only vocational interest. More as an amusement than anything else, he had taken a course in photo-engraving and as he acquired skill became quite proficient at it. This was all before bad luck walked in his front door. Now, faced with the necessity of making a living by some other trade than that of a watchmaker, he started thinking about his hobby

There were not many engraving plants in North Dakota, Newspapers were using a few cuts but not as many as they would like, because of the length of time it took to make them. Why not try to encourage the papers to dress up their pages pictorially? thought Weist. Bismarck, the capital, where Weist was located, was the buggest source of news in the State, and just at this tune a fiery political controversy was racing. News! And pictures would make it that much more interesting

By hard scraping, West got together enough money to buy equipment and set It up in his apartment. Next he took out a card in the district utuon. Then he started looking for business. The results were surprising. Not only were the newspapers interested but printers and advertisers, too. They found his work to be of high quality, thanks to the potience, care and precision that watch repairing had laught him.

lie still carries on the watch report work but today it is photo engraving that is giving him the bulk of his income.-B K., Bismarck, N D

#### THUMB INDEX INDICATES LOCAL PHONE NUMBERS

MUCH time can be saved in finding local telephone numbers in a directory that covers a number of towns if a thumb index is cut out so that the first page of the home exchange can be located without bunting for it To cut out the thumb space, open the directory at the first page of the local section and make a V-shaped potch in the preceding pages -- George A. SMITH.



When many towns are lasted in one directory a thirth notch saves time in finding your own



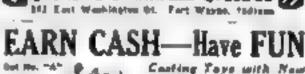
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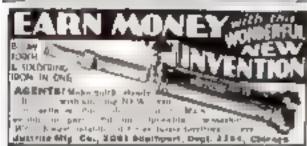


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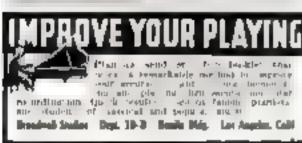
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### SOUVENIR COINS FORM NOVEL BRACELET

(Continued from page 60)

the borax is dissolved. Excess solder, if any. may be removed with jewelers' files, and the bracelet may be polished on a buffing wheel or by hand with jewelers' rouge. After but fing, wash the piece with soap and water and use silver polish.

A slip ring, which may be purchased at any jewelery store, is used to lasten the ends of the bracelet together. This ring is put on after the bracelet has been cleansed in the acid. It is best to soft solder (many a soldering tron) the link holding the ring. The beat necessary in hard soldering will destroy the temper of the spring in the ring

Hard solder may be purchased from dealers in metal-craft supplies and from jewelty stores. A piece less than a 1 to in square is ample to make any of the joints. An easy dowing after solder can be made by melting two ports silver and one part brain upon a charcoal brock. When the silver and brass fuse, they will form a ball. While the ball is still molten, press it out with a flat piece

### HOMEMADE SHOE CREAM INSURES GOOD SHINE



Applied eather before or after an ordinary abor posses, the cream improves the luster

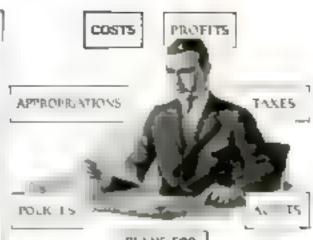
A SHOE cream that will produce a lasting lows: Take I part (say I oz. by weight) of shaved Castile soap and sixteen parts (16 ea by weight or ( pt ) of water and heat to boiling. Add 4 parts (4 oz.) of shaved carnauba wax to the soap solution. It will reads ly become creamy. She and when still very warm to the touch, beat in from 10 to 15 parts more of water. Continue heating until the iniviture is cold. The amount of the water last added will change the consulency to the descred potn)

If the shoes need some preservative, or quickly lose their slone, it is best to rub on the cream first and then apply the shoe porsh you ordinardy use. This emulsion impresnates the teacher with the carnauba way and tog regular blacking imparts the black color-If the regular blacking is applied first, which is also satisfactory, the cream cannot, of course penetrate as deeply, but it will, however, build up a brilliant waxy cost on the seather. It can also be used alone instead of the polish, but in this instance is best coloved, for black shoes, with water soluble nigrosine dye, or left "as is" for other colors.

Fastening a piece of felt on the underside of the cork of the wide-mouthed bottle makes application of the cream very easy.- R B W

### REMOVING STAIN FROM HANDS

To remove wood stain from the bands, rub a little lubracating oil or linseed oil into the pores very thoroughly, then wash the bands with toup and water and rinte well in clear WRITE-WALTER J. PEARCE.



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### The Diesel Engineer



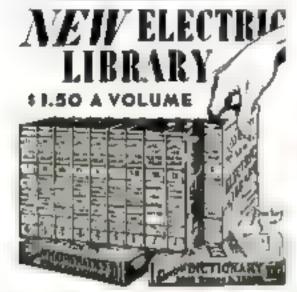
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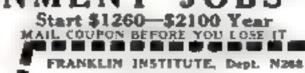


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Rochester, N. Y.

St. Rech to the westbook charge every of \$5 cape head. How as the F. S. Generalized July in the earliest for more summer I up and full particulars of ing how to get how.

444

#### HERE'S THE ANSWER

Continued from suze IT.

many of the webs we see are built by the female. The females web is likely to be much larger and stronger than the male's.

### When Seeing Is Deceiving

J L. B., WASHENGTON, D. C. Persons who have difficulty in reading often suffer from what is known as "word blindness." They tave difficulty differentiating between such words as saw and was, broad and beard, and gum and mug

### The Higher, The Colder

Q.—way is it colder on top of a mountain, in spite of the fact that the sun is closer?-S. H. B., Brooklyn, N. Y.

A -BECAUSE the air is thinner on a mountate top thus it is at sea level of does not hold the heat of the sun as well.

### Coal Per Person

J. U. T., MEMPHIS, TENN. At the present time, approximately tout tors of coal are used annually for every inhabitant of the United States. Because of the increasing use of oil and electricity, that figure is reduced every year

### What Is A Glass Snake?

A. W. G., Jr., salv lake city, vyast. The glass anake, which is not a snake at all but a lizard, comes by its name because of its brittle, highly polished, glassike armor. When a glass snake is grasped by its sail it merely snaps the member off with a twist and contables on its way apparently unharmed

### Not Much Left

A. K. V. retteato, its. Carbon and water account for almost five sixths of the total weight of the average human body. The remainder consists of lime, phosphorus, salt. tron, sugar potassium, tulphut, magnestum, fluorine, nitrogen, and lodine

#### Will Venom Kill Snakes?

Q -tax one cobra kill another cobra walt its bite?-G. W. H. Ba-more 31d

A -- rew arumai's poisons are fatal to themselves or their species. One exception, how-ever is the scorpion. According to popular belief, the acception often commits suicide by Straging itself

### Feeling Temperature

W O. F., cusicaso, and, According to the latest theories, temperature in felt by the contraction and disation of the blood vessels and not by a special skin mechanism as was one time thought

### Depends on Point of View

Q.-poza the sun stand still, or does it move?-D. T S., Dallas, Try

4 if all depends. As viewed from the earth, the sun stands still, we revolve around if If the sun were viewed from the stars, however it would be seen to move With reference to the center point of the entire cloud of known stars, the sun moves about thirteen mises a second, but the earth and the whole solar system move with it.

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Washington, R. C.

#### HOME EXPERIMENTS WITH INTERESTING ALLOYS

(Continued from page 55)

such a way that it dips into the bouid. When all is ready, the two electrodes are connected to the terminals of a six-volt battery, the carbon to the positive pole and the nail to the negative

Being positive, the carbon will attract the negatively charged chloring portions of the solution and chloring gas will be set free. The mercury, however, resting on the sail, will be negatively charged and will therefore attract the positive ammanium partion of the solution. Thus, the ammonium portion is set free, but, instead of escaping like the chlorine gua, it immediately amalgamates with the mercury

DIRING the first half minute that the current is on, the drop of mercury will appear unchanged. Soon, however, it will be on to swell and emit bubbles. For a minute or so, the drup will increase in size, expanding like a silver balloon until it is several times its original dimensions. Eventually, the mercury amateam will float up through the solution only to drop down again to its resting place on the nail. This process will repeat itself mega bon maya

The alternate bloating and finaling of the mercury annalgam is easily explained. It so happens that the ammonium amalgam is decomposed by the water as fast as it is formed giving ill ammonia and by dropen gives which busy the substance up causing it to float However, as soon as it reaches the surface, the gaves escape and the mass sinks to the bottom of the container where it again comes in contact with the negatively charged nair head and the entire cycle is repeated.

Incidentally, it is through this ingenious exterriment that chempts have been able to study the properties of the curious ammonium group. No one has ever seen nor molated the is mosium radical, or ammonium group as we have called it, but much has been learned from a study of its amagam

#### RADIUM IS PROPOSED TO DRIVE ROCKET TO MOON

A two-pay trip to the moon, propelled by radium, is the fantastic proposal seriously advanced by Prof. Indore Bay, Director of the Astronomical Society of Lyons, France. He declares that a rocket-like projectile could at tain sufficient speed to leave the sphere of the Earth's attraction if propelled by sufficient radium to develop 414,000 French horsepower. The interplanetary projectile, he calculates, would not have to weigh more than

### PEASANT-GIRL CHEMISTS MAKE POLISH FROM FISH

NASE POLISH obtained from fish is a new product in Vagoslavia. Peasant girls discovered a pearly polish could be made from fish which swam in Lake Ohnda. Now the material is being prepared for the market. It is reported the fish used are found only in this one lake

### TEN-FOOT TREE STUMP BRINGS SMALL FORTUNE

Oxe black walnut stump recently brought ils owner \$3,300. The stump, taken from the eround in Virginia, measured len feet across after the roots had been cut until a soud mass remained. Black walnut is prowing scarcer each year and is invariable for making gunstocks and airplane propellers. The wood in a stump where the roots begin to branch is said to be the most valuable of all.



### WHAT

### will you be doing one year from today?

Target hundred and sixty-five days from burn - what?

Will you still be struggling along in the name old job at the name old salary-worried about the future-never quite able to make both ends meet?

You recognize of course we are living in 6 New Day-the New Deal is a reality! Are you waiting, wondering-just haping? Don't do it, man-don't do it.

Choose the work you like best in the lest below, mark an X bende it, and without cost of oldigation, at least get the full story of what the L.C. S. can do for you.

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Prepart Parties .....

### MAKING A MERCURY BAROMETER

(Continued from page 64)

sharp eye on the column while this is being done, for if by accident a bubble of air enters the tube, it will have to be filled again, This will not happen if the open end is kept below the cistern level at all times

Remove the cardboard disk from the bot the by fishing it out with a pointed wire, for if this is not done it may act as a check valve to prevent the indow of mercury when the column rises.

If the barometer is set up in fair weather, the bottle may overflow in lunca of low pressure, since a falling column means a rise in the cistern level. To prevent such waste, such out enough mercury with a medicine dropper

to lower the distern level to 1/2 in. in good weather

When the bottle has been pushed back into place, screw down the lid. The a collar of fluffy cotton around the tube and push the cotton down against the cap to keep out **Dunt** 

All that remains is to arrange a reading scale. This may be nothing more complicated than a yardstick hung from n real in the back. A much better plan is shown in the drawing. Here the yardslick has been pierced by two slots and permanently



Indicator at top of the improved harometer

screwed to blocks inside one guard strip, with a wang screw (which may be a common screw with a metal fin soldered in the slot) in the lower one to classo it with. Since a burometer is read to tenths of an Inch, the six inches of the stick where the movement of the column top takes place is covered with a teste of tenths gloed and branded on.

To read the harometer lower the using serew and sluft the scale to bring the zero mark even with the crown of the mercury in the cistern. Then note the height of the common again reading to the crown of the mercury curve.

YOU may also add if you wish, a sliding pointer of some kind that can be moved to the sevel of the mercury whenever you take a reading. The next time you look at the barometer you can then tell at a glance whether the mercury is lower or lugher, and that is frequently all you wish to know

The scale gives all the reading required to keep a record of atmospheric pressures in voor own locality. However it you want to compare it with barometer readings in other places as reported in newspapers and shown on weather mass, you will have to figure what the reading would be at sea level wh the thermometer at 17 der F because official barometer readings are all reduced to this standard in fact for precise work they are further corrected to 45 dec. latitude but such correction is so slight that you may discegard it. The following simple rules are for standardizing

t. Temperature, Mercury expands with warmth, and naturally, with a given atmospheric pressure, the barometer in the warmest spot stands the highest. For every degree increase F each inch of the column sengthers 1 10,000 in, which amounts to quite a little, as a practical example will prove. Suppose that on a bright June day your ba-

rometer stands at 29.6. This same column, under the same air pressure If cooled from a summer temperature of say 90 deg to freezing temperature 38 deg. F lower, would shook 48 x 29 b x 0.0001, or 0.17 at which is nearly 1/0 un. On the other hand, if the reading were taken in January with the thermometer 26 deg below zero, a correction of D.17 in. to be added to the reading would be necessary, since freezing point is 58 deg. above the barometer temperature Therefore:

To correct for temperature Mo ply the column reaching in inches by number of deerees above or below 13 deg. F. and muiti ity the product by 0.0001. If the temperature is above freezing, subtract the correc-

tion, if below, add.

Altitude. Every 100 ft, of elevation reduces sea level pressure by about 1 10 in-If your barometer chilern were 1,472 ft. above sea level on that June day, your arithmetic would be ske this 1477 100 x 0 1 1 10 in. Adding this to the reading standardized for temperature, 29.43+1.39=30.83 in. There-

To correct for attitude, divide the elevation in feet by 106 and multiply by 0.1, reading the result as inches and adding to the reaching corrected for temperature

"HE extra refinements in scientific ba-Promoters, and the extreme care taken in building them, are simply to reduce errors, add to convenience of use, and to increase portability. If you would prefer to make a little more elaborate instrument than the one described, you will find some suggestions in the photographs and drawings on page 65.

In this barometer the upper parts of the guarda are replaced with L-shaped ways, so that an indicator can alide upon them. In use this indicator is slid to the approximate position and classped with the wing screw, Then the cross mark is brought accurately to the mark with a slow-motion screw. A rimp. of murror beside the tube reflects the mark and makes the read his doubly accurate

Instead of depending upon the end of a yardsick to serve us a zero point, another indicator board, also fitted with flow motion, is used. This zero board, which is shown on page 60 in correct relation to the scale rod, is of 14-in, plywood with a window cut in it to center on the width of the cisters wall. It projects 34 in, beyond the scale rod so as to run against the scale-rod way. This is to give exira stiffness. Glue a 14 in. block to the front of the scale rod, and glue and nail the zero board to the back edges of both

The indicator board, which alides ladependently at the top of the column, is shown in the lower right-hand corner of the group of drawings on page 65. The opening in the board is rabbeted behind on both sider. The indicator itself is rabbeted at the ends to correspond and alides in the opening. It is held from dropping out of the back by the guides bolted on to closp the ways. The windows in both indicators may be celluioid or glass with a fine horseontal scratch mark

For the slow-motion screws, machine screws with small wings soldered in their slots are salistactory. They can be made to turn with out end motion in their brackets by screwing buts on each side and soldering them.

Note the indicator board clamp. A small sheet-metal angle is housed within the way, and a 3/10-in. sound rod is laid in it. A piece of cold-rolled steel, flush with the rabbet, is then presed against the ways by the point of a wing screw, which wedges between the side of the angle and the round rod.

A door should be fitted to this barometer case, with a small window to enable the rise

or fall of the mercury to be seen.







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SOP BOTTON ST

#### SILK SHIPS IN WORLD'S GREATEST SEA RACE

(Continued from page 15)

and sped it to Los Angeles. As noon whistles tilew, the silk, riding ahead of the conches in a passenger train, started emilward on its final journey, to be watched at every stopping place by secret guardians until, four nights later its seal was officially broken in the presence of its purchaser

NOW that the volume of silk is increasing again, railroad officials expett to see the "silk specials" dashing acrom the continent once more. These fast trains consist only of an engine and three or more baggage cars. each carrying 230 hales of raw silk. They stop only for fuel and water; they cross from Parific to Atlantic in three nights and days

Raw sek today costs from \$1.20 to \$2.45 a pound. One of the arrest single shipments of dist year totaled 100, bales and was worth 43,000,000

Japan products nine tenths of the world's silk supply, and ships to the United States name entits of her rate salk. More than 500. 000 beles pour out through Yokohama and Kobe every year to be manufactured into articles of wearing apparel and for general use in the United States. Its value today nears \$100,000,000

Recently, through a combination of Yankee and Napponese scientific and mechanical ingenuity, silk has found several new met. It serves now to make men a suits traspera camping tents, hammocks, fishing nets, alpine ropes. and parnic bass, as well as the scores of obsects of art and amusement from national flags to ribbon, which for centuries have been turned out of silk

Raw silk is not, properly speaking, crude silk, for it has undergone the manufacturing steps of cleaning and recling into threads Oddly, although it is thought of as being very fragile, silk has an elasticity comparable to one-half the strength of steel, and it may be waven into cloth as thick as wool or so thin as to be transportent

Whence comes the raw silk these high-speed motor ships of the selk fleet race across the Parafic? The Japanese silk industry, which with rice-growing, constitutes a principal source of revenue for Japanese farmers, unainated in prefisitoric times, Charse as thes unce were, goods made of silk have been high ly regarded in the Orient for centuries. There was a time when official rank was shown by the amount of silk worn. Women of the etalted families once were silk kemosos and hokemas longer than they were tall. At times, they were twelve extra thicknesses of tilk clothung

ACCORDING to legend, raw silk was the the "goodess of the silkworm." But the goddem has had far less to do with silk production than have highly cultivated soluvorms

Each year, the Japanese Government es periment station inspects the crop of ailkworm eggs from which 2,000,000 farmers produce coroons, and destroys the poor ones. About mid-April, when the young buds of the mulberry trees on the leaves of which the worms feed, begin to sprout, the farmer removes the eggs from cold storage to a warmer atmosphere Within ten days, tiny worms, resembling small ants, break the shells and emerge. From the first day, they eat chopped mulberry leaves, placed on trays

As the worms est the succulent leaves, they grow rapidly. After a few days they become quiet, stop eating, and sleep for several hours, then their skins crack and peel off. They sleep four times in the course of their development, and at the end of four weeks are matured and ready to spin their fine recoons

(Continued on page 100) At this slage



Wanna Buy a

#### natatorial bird having iamellate mondibles

These at least are the words you will find la some elictionories under duck — words requiring further search, and wasting preciese minutes. Contrast these with the follewing clear, mable, and eccurate definition, complete in one reference:

BUCK—any of many fint-billed water-law! (family <u>Anatides</u>) with short legs and nest.

Of course, this definition is from the one dictionary that defines every word so that its me and meaning can be understood instantly.

# Simplified

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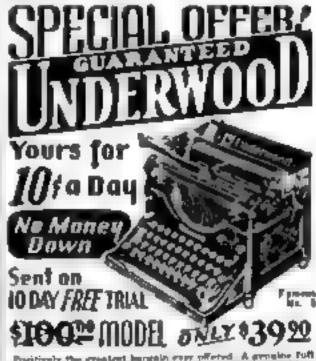
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## SILK SHIPS IN WORLD'S GREATEST SEÄ RÄCE

Lantinued from page 205)

they are moved to specially prepared nests made of small straw sticks; there, within a day, they begin to spin their cocoons, to weave the fine threads around themselves The silkworms gradually shrink as the delicote alkaline filaments are emitted from their mouths, until at last they have lost three fourths of their original size and weight

TEN days later, if left alone, the chrysalis mosts and is transformed into a soft gray moth, it pushes its way through the wall of the roroon by denotying the outer layers with a fluid from its mouth. The moths mate, the male dies unmerhately, and the female lays from 300 to 500 ears, to complete the life evele

Because the pierced cocoon is not mutable for recling, both by reason of the broken strands of sak and tiny parasites which develop, the farmers deliver their new coroons to the silk rectors, of which there are 3,700 scattered through Japan, as soon as the cocoons are completed. The raw cocoons are then deed at a high temperature in large ovens; best destroys both the chrysaus and the parasites. Then they are stored for several weeks, until the time arrives for recling the raw sidk fiber

The cotoons are formed twice a year, immediately after spring and just before autumn White encourse predominate in the spring crop, s clions up the late summer and ourly autumn. The former produce white silk, the latter yellow. The two crops are about equal in quanbly. The cocoons are converted into raw alk at the recking mills, they become flow silk and material for fine-spun silk yarn; depending upon the quality of the cocoons

Approximately + 0.000 basins are operated in the regime much. These basins correspond to spindles in a cotton factory. In them, science and human hands jota to unwind from 1,500 to 3,000 feet of fiber from a single co-

THE cocoons are first sorted and, then, beboded. They become soft and easy to draw off Then a garl worker, sitting at her beam of hot water, in which scores of bobbing cocoons await their turns at bring unwound, slides a brush made of twigs across the surface of several cocoons, and tangles the ends of from five to seven filements. The number of ends depends upon the quality of silk thread desired

She quickly injects these filaments through the center of a glass buttonlike end-collector and winds them around a wooden frame. As they unwind, the filaments pass over several glass wheels, and through mechanical twisters which squeeze them tightly into thread, held intact by the softened gum. The girls take prest care to avoid breaking any of the filaments, and at the same time keep the single thread running and winding at great speed

Recently, production of silk has jumped to meet the increased demand in America, Increased production is made possible by a change in the talk warms, themselves,

Some species have only one life cycle, other species go through the cycle from egg to cocoon twice or oftener within a year Japanese scientists have found it possible to change a one-life worm into a plural-cycle worm artificulty, by immersing the eggs in a secret chemical solution, Scientists can also basten or retard the time of hatching at the start of he le cycle

hour pounds of cocoons make one pound of recied sak, which is the raw nik that is first wound into bundles and finally packed into tales for the race across the Pacific

## MODERN ENGINEERING FEATS ECLIPSE THE WONDERS OF THE PAST

Continued from page 13.

speeds must have super-lughways with surfaces as level as a bastroom floor, free from high spots which might cause accidents. A new roller for roads exerts buze pressure as high spots are met, making a level surface which permits high road speeds without sway

"O GET dozens of backwoods communi-Thes nut of the mud, engineers are expermenting with low-cost surfacing mate rials that can be put down cheaply enough to extend good highways to every part of the country. Metal roads are actually in use —one in the west, where copper-bearing sand, thrown out from the stamp mills, is mixed with asphalt and paving cement for a new highway, another in the east, where cast-iron blocks are used to form the roadbed. In Cleveland, old paving blocks are being placed between and along the tracks of a railway and imbedded in concrete, vibrated into place. Less concrete is needed and cost is cut

A new twenty-four hour cement aided in building an eighteen-mile New Orleans street A block at a time, contractors paved it, then let the traffic on it next day. Formerly, concrete povement had to stand twenty each! days before traffic could be allowed on it

As air lines spread their network over the country, new landing fields will swell the number of construction twosects. The Philadelphia Post Office now has a concrete street floor upon its roof. It is a 300-by-500-foot landing deck, used for autogross which will

transport mail to the Camden, N. J., airport and return. Out at sea, the 5,000-ton motorslup. Schreabenland, with a rotating catagorit. aboard is anchored somewhere between Africa and Brazil, as a companion to the floating sirport Westfales stationed on the sir route rast vent

Almost every section of our country may soon be transformed through application of modern engineering to its problems. The colossed sum of more than \$100,000,000,000 may be spent over the years just ahead if plans of President Roosevelt's National Resources Board are put into effect. Engineers have looked the country over and have found it hadly in need of improvements. They say that of the 6,000,000 farms in the United States, only \$00,000 bave electricity, although a network of giant power lines could provide at least 3,000,000 of them with electricity

ALMOST 2,000,000 usiles of unimproved roads need surfacing; 5,000 dangerous railroad grade crossings must be made safe Power could be generated at the very moutas of coal mines in Pennsylvania, About 5. 000,000 acres of barely productive and need to be taken out of use, zudions of scres of good lands elsewhere await only irrigation to make them righly productive-a project which could remake the whole agricultural map of the country. These are some of the ways in which recent scientific advances may he applied som on a gigantic scale, changing the whole aspect of our country

#### LET ME HELP YOU PLAN YOUR CAMPING TRIP

(Continued from page 31)

or opened easily within a half hour Nor need you stant yourself in the boxes of one camping party I saw pancake floor canned chicken and ham, bacon, eggs, canned milk, coffee, tea, chocolate, lima beans, spinach, asparagus, grapefruit, spanish rice, tomato juice, blackberries, cherries, plums, pears, hominy, apricots, whole new potatoes, and haby beets, all easily packed on the backs of horses. Trout, caught daily by members of the party, formed the backbone of nearly all

evening meals.

THERE is no reason for anybody's suf-fering two weeks of discomfort merely for the privilege of displaying sun and wind burns to his friends. A vacation should be both a change and a rest, even though you may find your rest in exercise. For that resson, I consider the bed the most important camping accessory. In the mountains where nights somet mes are very cold some will prefer double beds. A bed consisting of metal framework and canvas slats will be found comfortable. Either a mattress wide enough to cover the bed or two single mattresses, tied together, may be used

I prefer a single camp tot with an ale mattress. These fold late compact, light bundies and are perhaps more easily transported than other kinds. In any event, remember that cold enters from below as well as from above. In cold country, unless you are using a seeping bag, place two blankets and a layer of newspapers under the mattress and three or four blankets above. Don't bother with sheets. It is more comfortable to sleep between cutton blankets. Guant pafety pros. about four inches long, inserted through all thicknesses of upper covers and mattress at sides and font will hold the covers together nicely.

Since I recommend camping for comfort, I also recommend hot water bottles. It is better to be criticized than uncomfortable A severe thange from heat to cold may ruin an otherwise enjoyable vacation. In warmer country, of course, you may prefer to sleep on the ground, or on a cot with only a light bianket for cover

Having provided for your sleeping comfort, remember that burns and bites may easily be avoided. Leave your tent neiting ited down during the day. This will keep mosquitoes and flies outside. In mosquito country you will find a lotton made from equal parts of oil of cedar, oil of cintropella, and iii of camphor mixed with petrolatum, to be very effective. A liberal application to face, neck, and hands will keep insects away from your body for a full day

Head note of some light, open material may be preferred to the lotion. Take a section of neiting about forty inches long and twentytwo inches deep, bem it the long way on both edges and insert a draw string in each hem Sew the ends together. By drawing the top edge entirely closed over your hat and the lower snugly around your neck you will find freedom from bites. Tuck the lower edge under your sweater or Jacket.

Wind burns, particularly to aps and nose, may be bad even in cloudy weather Cowboys wear large kerclucis around their necks, not as armaments, but for protection By tying a large silk kerchief around the lower part of your face, you will avoid chapped hips. If it slips, book it over one car Here are two novel makeshifts that will protect nose or lips. If you wear glasses, sew a piece of surgeon's gause to the bridge, spreading it fanlike over the nose; or prese the gause against a small piece of surgical tape, and stick the (Continued on page 108)



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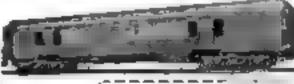
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## LET ME HELP YOU PLÂN YOUR CAMPING TRIP

(Continued from Juge 107

tape to the upper bridge of your nose, again permitting the gasze to extend far enough down to give the desired protection. You can also protect the lips by stacking the tape to the upper lip ammediately below the nontrils. The gauze will cover both lips, yet permit you to speak easily,

WOULD never clutter up a camp with lights. One kerosene or gasoline lanters will serve a camp of almost any size, excepting, of course, a flash light for each tent. I have seen too many cans leaking oil, too many tuckages of food spoiled, to take chances on transporting more than enough to supply actual needs. By turing the evening meal before sundown, you not only can clear away the dishet by autural light, but he ready to enjoy the camp fire and a sound night's rest to make ready for the next day's efforts. When undressing, lay a flash light across your bed. This gives all the illuminaton needed in a tent

Possibly the two most important latchen aids are a sharp knife and two can openers The autimatic type of ran opener works more cases, and a second one to reserve comes in hands if the first becomes du. Three compartment plates simplely the serving problem. Place the main dish in the larger compartment, using the two smaller for vegetable and descett. Be sure the camp ax is of good quality and sharp if you expect to cut much wood. Empty cans, upended, may be used

to cover sugar jars and milk cans and to hold tooth brushes. Cups should be of enamel. Tin rusts and dents easily

Whether you plan to pack into the mounturns of take the family on an easy jaunt in the cur, he sure to take collapsible chairs and tables. One table, about thirty inches square. rolls up into a bundle the size of your arm and will accommodate at least four people Folding chairs with canvas backs and seats are particularly comfortable. Some types make a compact bundle no longer than two feet and four inches in diameter. These may be packed easily on the floor of the car

Perhaps these few, simple suggestions based on my long experience in packing city people into the Sierras, will help to make your camp tracation what it should be-a real rest,

#### CAMP SITE IN ROCKIES USED BY PRIMITIVE MAN

Mystrators Americans rouned the Rocky Mountain region 30,000 years ago. This fact has just been uncovered by the discovery of an enormous camp site and work shop in the foothills of the Rockies. It is a most half a mile across and is covered with about twenty feet of dirt. Stone dark points and the bones of prehistoric animals that lived when glaciers of the Ive Age covered great areas of the Luited States, are being examined by scientists to learn new facts about these people, thought to have been the first Americans

## CREATING BEAUTIFUL NEW FLOWERS

(Continued from page 52)

the fall, to be washed down by winter rains, or four weeks after planting

A few days after the first watering, you can give the plants a good soaking. From that point on, you may cultivate by hand or with a rake twice or three times between waterings. This method not only saves water bills, but is better for the plants. Loosening the surface forms a mulch and preserves the moisture, by preventing evaporation through the many capallary tubes which form in the soil around the roots

O AVOID disease in the garden you will do well to select resistant strains. Good preventives and insecticides are easily obtained You may error counter attacking some of the more varuent diseases such as stem rot in asters or black spot in roses, for the diseases themselves ruin a garden quickly Black apot may be beaten back with a good dust or spray, but stem rot is caused by a disease funeus of the soil. Here is a challenge worthy of man's best genius

Some years ago, stem rot was attacking asters in many countries. This fungous growth. which thrived on both the root and the whole plant, made so undespread an appearance that something had to be done. It had been known to live twenty years in soil where there were no asters, though it did not attack

other plants When faced with this problem, I decided to encet the disease on its own terms. I planted asters in diseased ground. The first year only two or three plants survived on each acre of plantings. I planted seeds from those survivors the following years. Gradually, by careful selection. I evolved a resistant strain which now defies the fungus and thrives madely Whether the defense is a chemical reaction or a tougher plant cell I do not know, but use of resistant strains is the only way in

which to overcome the ravages of stem rot Nor does the duesse have any apparent effect on color White flowers which are supposedly wester, attain a size and beauty equaling if not successing that of the reds. You can meet like problems similarly in your own

Roses offer a problem all their own. Crossing season. Good pruning is essential if you ast and requires a longer time than seed plants. You can, however, bud successfully, though grafting is seldom practiced

All roses should be pruned after the flowering season. Good prusing is essential if you desire full-bodied, fragrant flowers, On a young bush, say not older than two years, pruze back severely, leaving only three stalks from twelve to eighteen inches long. On older plants, more and longer stems may be left, but these should never be more than thirty inches long. The more severely you pruze, the more suckers and longer stems will come out next steine

B DDING may be undertaken from March to September in remote of mild or warm chroate, in the east, it should be done to March. First, select a busky root stock Scoot. away the earth to expose the root. Take the bud from a stalk which has borne a rose, cutting it away near a leaf stem. The stem wil. enable you to handle the bud without injury. With a amall, sharp knife, aplit the bark immediately below the union of root and stem, making a "T" just large enough to take the bud. Luft the corners of the "T" slip the bud beneath, and bind the wound, I have found it a good plan to use a rubber band for this purpose. Wrap the rubber several turns around the wound, taking care not to cover the bud, and tie. The rubber will producity deteriorate, making further care MODECESSARY, (Canimued an bage 109)

#### YOU, TOO, CAN CREATE BEAUTIFUL NEW FLOWERS

(Continued from page 108)

Selection of a strong, reastant root stock is important, most fancy varieties show low resistance

Tree roses should be pruned back and climbers thinsed out according to your per sonal preference. Climbers may be budded on tree roses. If you want a variety of colors you may place as many as four buds, one of each color, near the top of each stalk. A climber stock budded to a tree rose will give an interesting weeping effect. Bush roses generally should not be budded on thinbers, though a bush budded to a long stalk of a ragged-robit will grow successfully.

YOU may conduct your crossing experiments with annuals with every confidence of interesting and successful results, for the serds of new varieties available from seed stores broughout the nation have been tested by ten of the country's leading experts and found to be hardy, healthy, vigorous and true to color and type. These ten experts are members of the Ail America Selection Committee, of which W Ray Hastings of Atlanta, Ga., is chairman

Each year, seed growers submit new species to the committee. For the 1935 season, 139 entries were submitted. The judges planted seed from all entries, identified by number and not by the originator's name, and, by secret vote, chose fifteen as worthy of presentation to the nation's amateur gardeners.

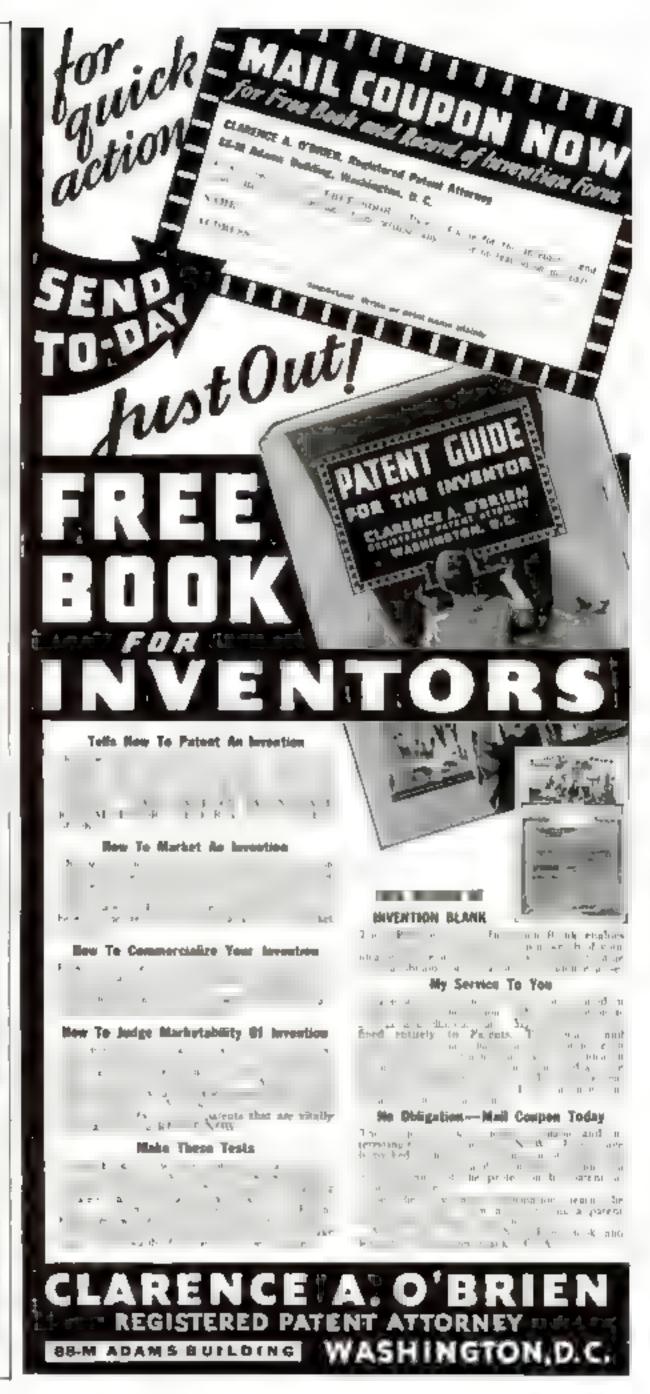
From these, a new orange cosmos was selected grand champion. This easily grown flower blooms in ninety to 100 days after paning, order varietys take as months. The beauty of the orange cosmos was an important reason for its selection.

The committee, established in 1912 at Atlanta under the austices of the Southern Seedsmen's Association, and now jointly sponsored by that organization and the American Seed Trade Association, conducts the trials in the several chimatic and geographical sections of the United States and names, in order of their garden importance, worthy new items. The committee recognization worthy new species, varieties, and strains

Seeds reaching you through dealers are grown and harvested on large ranches, of hundreds of acres. Nasturtium plants, for instance, are cut off at the soil when the majority of the plants are matured. Immediately they are rolled into halls to prevent the seed dropping. Although the plants are green when cut, the food stored in them matures the seed rapidly. Four days after cutting, the plants are spread on large sheets of canvas, and are shaken every two days until all seeds have dropped off. Finally, the seeth are cleaned by air and acreens; then they are ready for distribution. From these you can continue hybridization and electron, and achieve perhaps even greater beauty and hardiness than have the professional growers.

#### INCUBATOR FOR EGGS OF RARE BIRDS MIMICS HEN

Devises for batching the eggs of care birds in the Moscow, Russia, Zoo, a new tarmbator imitates the methods of the birds themselves. The ordinary incubator heats the eggs are formly throughout. The new apparatus heats the top of the eggs several degrees warmer than the bottom and allows them to cool off occasionally, just as they do under natural conditions when the mother hird leaves her nest. The complete heating and cooling schedule is set for twenty-four hours in advance by the scientist in charge of the incubator, and the machine automatically follows the cycle.



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#### LABORATORY OF WARFARE KEEPS OUR ARMY UP-TO-DATE

(Continued from page 36)

wheelbarrow. Gas and oil will be transported in the same way, abolishing the gasoline tank truck. These changes will simplify manufacture and operation of vehicles for use in the tield

The Department of Experiment aims, wherever possible, to standardize field equipment. For example, tests are now being made to evolve a standard portable footbridge.

To cross a stream, in the face of a storm of lead and steel from un enemy holding the opposite bank, is one of the most desperate tasks that face soldiers. While consume, they can hardly fight back. Many may be killed and wounded, while more may be drowned it the bridge collapses, or is shot from under them. Often they must bring their own bridge and build it moder fire. The bridge must be not only strong, but light and compact

NOT long ago, in realistic maneuvers, the 29th silently and in darkness sneaked up its material, haid it over the unfordable I putor creek, and triumphantly, in face of chairering machine trans trossed upon it. The planks were of waterproofed white pine For the floats, three materials were tried—tin cans, puffed rubber, and baka wood

The tin care-large ones, of course-were cheep, light, and very satisfactory, until machane guns punctured them. The rubber had been exploded in the presence of a gas that expanded it into a spongy mass. It and the balan wood were shot full of holes, but lost little buoyancy, But after the 29th had marched and countermarched over the parrow footway, and tested it to every way, the verdict was in favor of baba.

But troops can get from place to place more quickly through the air, than over a footbridge The British in Palestine, the French in Africa, have done it in wars with hostile tribesmen, dealing surprise strokes out of the blue. Our Army has never done it in war, but we are now ready to hurl through the air a war strength Infantry bullalion doughboys, packs, rifles, machine guns, one-pounder cannon Irench mortars, and ammunation. Benning has been experimenting on the problem, ralculating to the hot ounce how many "fly ing doughboys" and what enuipment could be squeezed into a twelve-passenger transport

Peace-time maneuvers are tricky enough, but war brings additional troubles. Using war-worn maps, a column of troops may go marching down a folded crease that looks like a road, or get surrounded on a smudged spot made by little drops of water Rain may turn maps into pulp. Or mucht, until the Department of Experiment went into the kitchen and found that innecent cooking paper makes the best war maps. Made to stand hest and grease, it has been soaked in water or carried folded in porkets for weeks, without damage So the paper on which Mother bakes cakes will win or lose battles

DISCOVERIES no less surprising are making the infantry man more formidable in battle. Until the World War, he fought with rife and bayonet. Today he has automatic petols, one-pounder cannon, band grenades, trench mortars, Browning beavy and light machine guns. Those Brownings were the best in the World War, flenging experiments have improved the heavy gun with a new recoil mechanism, and provided the light gus or automatic rifle with a folding shoulder piece and n bipod at the center of gravity. It can be fired lying down, at ground troops, or, propped up by an ordinary rifle, at airplanes.

In 1913. French soldiers threw away their own rifles for discarded American Springfields, now that Springfield is to be superseded. It fired three and a half miles, ten shots a missute. It gives way to a remarkable new semi-automatic rifle firing thirty to sixty shots a manute just as accurately, and less turingly to the marksman. The current approprietion hill provides 1,500, which is just a beginning. When the 29th finishes getting the bugs out of the new model, it will do things to modern warfare. It shoots the new long-range streamlined bullets that were models for streamlined trains and automobiles

This bullet is fired by the 30-caliber machine gan, the "beavy gun" of the World War But there is a heavier gun now, the 50caliber, recently much improved to shoot down an armored surplane or puncture the steel hide of a tank, or for use as the main weapon of our own tanks, New, both these guns, and the french mortar, are made more deadly by Capt Sidney H. Negrotto's six years' work on an all-purpose machine-gunmount, of which the first completed specimen has just reached Benning

T IS a triumph of simplicity By cutting I nut unnecessary parts, Captain Negrotto reduced the weight of the old mount six pounds Release one bolt, and the gan can be erscantly uptilted to spit bullets at an earplane-sixteen to the minute. The new mount makes the gun fifty percent more accurate.

The Army is economisting, like every one else and to save ammunit on Benning is experamenting with ways to teach soldiers to shoot without burning any powder. One method uses a device that throws onto the target a pattern of light almost the exact size of the pattern of bullet marks a machine gun would make at the same range. Putting the injuser causes a spot of light, the size of a bullet hale. Sometimes it findles on, then off, just as a muchine gunner fires one buest, then another Sometimes the stora are longer, like

arms. A sounding box makes a racket all low realistic. The whole thing can be put into a cigar box attached to the machine gun a flash light hulb and socket a screeption lens, a switch and joine wire Total cost \$5, total saying in ammunition, many times that

Another way to save money is to turn from brass an exact reports of a one-pounder cannon shell. Then, through the center of the base, where the cap would be, drill a hole just large enough to take a 45-caliber pistol cartridge. Put the shell-cartridge combination into the breech of the cannon, and fire at your target. There have even been experiments in firing .22-caliber cartridges at a cost of \$4 for 1,000, as assured \$30 for 1,000 for the 45caliber.

There is also an ingentous indoor anti-alrtraft tange especially good for Northern climates where there is much darkness. A demonstration is much like a visit to a movie. The room is darkened, and its 100-foot firing range leads down to a screen of white paper in a heavy wooden frame. In the sides of the frame, bucked by reflectors, are eight 200watt lamps. These make the paper luminous. A silhouette appears upon it—the shape of unanzplane.

Rar tar tur fut?

The machine gunners are at it, trying to drill that sky-hawk, before he can theoretscally drill them with his own machine gunor blow them to pieces with his bombs. The builets puncture the paper screen and strike a bullet-proof sheet-metal backstop. If a bullet buts the black silhouette of the auplane, a beam of light shines through from the himps.

THE Army's anti-circraft range at Camp. Perry, Ohio, also has moving targets simulating airplanes, something like a Coney Island shooting gallery. (Cantinued on page 1.1)

Thie One EYEN-06W-CJE8



#### LABORATORY OF WARFARE KEEPS OUR ARMY MODERN

(Continued from page 110)

The average reader hears so much about airplanes and air raids in "the next war", that he forgets the progress in devices to bring down those sirplanes and break up their raids. Not only are anti-aircraft cannon and machine guns more effective, but the devices for listening, aiming, and firing have also been greatly improved.

IN OUR Army, tanks are no longer a sepa-rate corps, but a weapon of infantry and cavalry. Not long ago they drove out to a secluded spot on the Fort Benning reservation, a tank of war-time type, but with good, tough 3/5-inch steel armor. Inside the tank, where the crew would ride, were placed painted dummin representing men. Then, upon the ground soldiers set up a strange, spider-like tripod, bearing a machine gun of foreign design. This they aimed at the tank, and pulled the trigger. From the weird gun's muzzle drove bullets. Their crushing upon the tank's armor, was followed by the sound of explosions within the tank.

An officer walked over to the tank, reached in, and brought forth the dummy soldiers. Each was punctured and torn with bullet marks; some seemed to have been shredded, as by explosions. The bullets that had been fired had a steel core, but coated with soft lead and copper so that when they hit the tank, the tip mushroomed and clung for a fraction of a second. The steel core drove through the armor and into the tank. Within the steel core was an explosive charge which detonated in the interior of the tank. The

dummies showed the effect. Since 1918, there have been great improvements in tanks, worked out by the Ordnance Department and the Infantry. Engine cooling has been bettered, anti-aircraft guns and pistol portholes added. Remote control of some guns may be possible. Tanks may be protected against gas by adding a power-operated blower to filter the alr. Tank crews may wear gas masks fitted with a laryngophone, a sort of metal membrane held against the wearer's larynz, which when talking, vibrates the membrane. The tank commander will direct his fleet by radiotelephone, for which special helmets have been devised. The most important defensive tank improvement has defeated the tank driver's dreaded enemy, the burning hot lead that comes spattering lato his eyes from bullets fired at his narrow peep slot. The peep slot has sow been insulated with a new, non-inflammable transparent laminated glass and a material like celluloid.

WHAT seemed the greatest offensive improvement in tanks, was speed. Here was something that might revolutionize modern warfare a land battleship with armor too thick to be penetrated by ordinary rifle or machine-gun bullets, and moving too fast for artillery to hit it except by chance. Here was something infinitely more powerful than the World War knew, a weapon, sudden and swift, thrusting through, rapieriske, to a vital part, defying resistance.

But while the World War knew ar piercing bullets as a defending shield, 1935 knows not only better tanks, but better armor-piercing bullets. Especially, explosive bullets, Tank advocates, notably Captain George A. Rarey, author of "The Fighting Tanks Since 1916," state that modern tanks, when used en masse, will constitute one of the most serious defense problems with which armies will have to deal. Will the actual test of buttle show that the defense has indeed found a shield, in bullets that not only pierce armor effectively, but, when they have pierced it. explode inside? Will a new wrinkle once more change the course of history?

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#### AUTO RACING IMPROVES PASSENGER CARS

(Continued from page 70)

be made popular with the man of average income and average driving skill, smaller motors would have to be developed.

In accordance with their policy of making the Indianapolis race a proving ground for development along desired lines, the men responsible for framing the entry conditions for the 1920 race limited piston displacement to 183 cubic inches. By 1926 progressive reductions had gotten it down to ninely-one and one half cubic inches.

The builders of racing cars met the challenge by turning out small high-compression engines that produced high horsepowers because they ran at high speed—up to 5,000 and even 6,000 revolutions per minute. Although the new engines were only one sixth the size of those used in the race fifteen years earlier, they developed more than seven times as much horsepower, and used less fuel and oil. They could drive the little 1,450-pound racing cars at 100 miles per hour,

AGAIN the lessons learned in racing were applied to the building of passenger cars. Smaller engines made automobiles cheaper, and high-appead, high-compression engines gave more economical and smoother performance.

By 1030 the guardians of the Indianapolis race had decided that the low limit on engine size had accomplished its purpose. The waspish little racers were too fast, they said, and fatal racing accidents much too numerous. So they increased the displacement limit to 360 inches, demanded that each car's weight be in due proportion to its power, and ruled that a mechanic must ride with the driver.

Again the builders of racing cars met the challenge, and so successfully that the last three Indianapolis winders libror averaged over 204 miles an hour!

Most of us can remember when tires were guaranteed for only 1,000 miles. Just a few years ago we were satisfied if we got 3,000 miles of service at top speeds of from forty to fifty miles per hour. Now we expect between 15,000 and 30,000 miles from our tires, at top speeds up to eighty miles per hour.

Racing deserves much of the credit for this tremendous improvement in tires. Race drivers were the first to demand treads that would not come off. They were the first to recognize the superior safety of the straight-sided tire. And they were the first to use the now universal balloon tire. To eacing also must go most of the credit for the development of the demountable rim, and the introduction and popularization of the wire wheel.

Racing remains of high value to the automobile industry. Last year one manufacturer obtained a twenty-one percent increase in horse-power over his 1933 car without increasing the displacement of his engine. Racing had taught him things about carburization, piston and cylinder-bead design, and the advantages of various metals, that made the improvement possible. Another manufacturer took advantage of stock-car roadracing experience to strengthen a part of his car that never had shown weakness in ordinary service.

Raring will go on. Speeds will increase. Kaye Don, a famous British speedster, fore-tasts that within the coming four years some dare-devil pilot will drive at the rate of 350 miles per hour. And every time a record is broken, the automobile industry will learn things that will help it to produce better cars.

As Sir Malcolm Campbell, the little Scot who is the only man left alive of the five who have driven at speeds greater than 200 miles per hour, is fond of saying:

"Only by adventuring and pioneering is progress possible."

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